Pit and Quarry

Published Bi-weekly on Wednesday for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime and other Non-Metallic Minerals

Subscription price $5 for 3 years; $2 for 1 year. Single copies 25c
Canadian and Foreign Subscriptions $1 additional for each year.

Entered as second class matter October 9, 1928, at the post office at Chicago, Illinois, under the Act of March 3, 1879.

COMPLETE SERVICE PUBLISHING COMPANY
538 S. Clark St., Chicago, Ill.

H. W. BAUMGARTNER
President and Treasurer
H. W. MUNDAY, Consulting Editor
H. A. LAMB, Associate Editor
G. B. MASSEY, Associate Editor

V. E. LARSEN
Vice President and Managing Editor
J. O. DURKEE, Associate Editor
W. E. TRAUFFER, Associate Editor
F. A. WESTBROOK, Associate Editor

Eastern Representatives

S. E. COLE
1235 Watchung Place
Plainfield, New Jersey

W. A. BUSCHMAN
P. O. Box 53
Upper Darby, Pa.

Vol. 17 CHICAGO, ILL., DECEMBER 5, 1928 No. 5

FEATURE CONTENTS

Men of the Industry 33

New Plant of Ottawa Sands Corporation Ready for Operation 35

Sudden Growth of Small Sand and Gravel Plants 40

What Safety Means to a Quarry Executive 43

Byron Sand and Stone Company Operates During Entire Year 45

Cutting Down Labor Waste 47

Sowing Seeds of Safety in the Major Departments of a Company 51

Illinois Gravel Plant Now Under Construction will Deliver Material by Boat 53

Records that Watch the Work of Salesman 60

Gasoline Engines in the Pit and Quarry 63

Vibrating Screens 70

Pit and Quarry Foreign Digest 72

Portland Cement Association Discusses Pertinent Problems of the Industry ... 75

Intimate News of Men and Plants 78

News of Equipment Manufacturers 81

Copyright 1928 by Complete Service Publishing Company

Next Issue December 19, 1928

150 to 200 tons of rock per hour is the rated output of the "75-B"— an output that can be counted on as average, and sometimes bettered when digging and hauling conditions are favorable.

This new 2½-yard shovel will save many owners thousands of dollars in plant cost

You know some quarrymen— and so do we— who need more capacity than they can get out of a 2-yard shovel, but who have hesitated to invest the cost of a 3-yard machine.

The new "75-B" BUCYRUS-ERIE has been developed to fit right in, and meet the 2½-yard shovel need.

It combines the speed and snap of the 2-yard shovel with a working range that is within a few inches of the 3-yard shovel's.

A Real 2½-yard shovel—

Not a 2-yard machine which has been "stepped up" in size, but a shovel designed and built from the ground up to handle its 2½-yard dipper.

Built along the same lines as the 100-B and 120-B BUCYRUS-ERIE, 3-yard and 4-yard shovels. With the same type of box-girder boom, made possible by the use of outside dipper handles— giving a stronger "business end" with minimum weight.

Thoroughly proven in rigorous field testing—

A machine that is as Reliable as the larger BUCYRUS-ERIE rock shovels. Thoroughly dependable in continuous hard service.

Write for complete description of the 75-B—

BUCYRUS-ERIE COMPANY

Plants: South Milwaukee, Wis., Erie, Pa., Evansville, Ind.

General Sales Offices: South Milwaukee, Wis., and Erie, Pa. Representatives throughout the U.S.A. Offices and agencies in all principal countries.

BUCYRUS ERIE

BRANCH OFFICES:

Boston	Birmingham	Chicago
New York	Pittsburgh	St. Louis
Philadelphia	Buffalo	Dallas
Atlanta	Detroit	San Francisco

Pit and Quarry

Vol. 17 CHICAGO, ILL., DECEMBER 5, 1928 No. 5

BUSINESS CONSOLIDATIONS

THIS is a period of consolidation. The underlying causes are concealed in the economic history of America. There probably has never been a period in the history of man when there has not existed some form or other of consolidation. It is the law of the herd and organization is the answer to the problem of safety and well-being. It is the problem of existence that keeps men together.

Therefore, there is no cause for wonder, that when so vital a question presents itself as a factor in well-being, similar lines of group organization should maintain. Unity of interest offers industries strength and power that make possible economies and profits.

The natural trend of industry to build within itself large operating units has been greater than the enaction of restrictive legislation. There are without doubt more instances of combinations today than there were twenty-five or thirty years ago when the Sherman anti-trust law, enacted in 1890, had been invoked to make little businesses out of big. And there is but little reason to believe that industrial consolidation will diminish in the years to come.

It is the probability of an increase in the speed of the movement toward consolidation that suggests the idea that the coming decade will be a period of consolidation. The factors making for combination, which are inherent in men and business, still exist in unabated force. Legislative restrictions still continue and new acts will be promulgated, but they will be along constructive rather than restrictive lines. Most types of mergers or combinations which industries will build will not run afoul of legislation. Modification of past laws may follow to meet the conditions and benefit business.

Not all men of business will agree that consolidated interests and activity resulting in mammoth enterprises are economically sound. There are others who will say that big business is not progressive—its very size creates impersonal management and the laxness which results from a consciousness of undisputed power. Impersonal management and laxness encourage waste and inefficiency which spell decline in industry. Others will say that consolidation and Big Business will destroy "equality of opportunity."

These objections are, largely, a matter of personal opinion. Whatever growth that has taken place in Big Business does not so far seem to have stifled personal initiative nor removed the opportunity and incentive for personal aggressiveness. Nor can it be charged that large corporations are inefficient, wasteful and unprogressive. Some of the most outstanding institutions in American industry, judged from the standpoint of profits made and progressive contributions to business, are those which can unmistakably be classed as "Big Business." So far there are no real grounds for fear that consolidations in business will wreck or weaken its structure, rather it will strengthen it.

A fundamental reason why consolidated activity has not grown more rapidly is the fact that individual initiative has not been handicapped by Big Business.

When the power of the individual is the dominating characteristic of industry, individual endeavor reaps its own reward.

The individual will not be last, the call for initiative on his part will not be diminished by the necessity for employing it in a consolidation or group purpose and in unison with other men's endeavors.

Everyone, at least every industrial leader, prizes the sense of leadership. To be a leader, if only of a small group, is preferable to being second in command of a larger and more powerful force. It is not easy for one who has held full sway to be compelled to listen to others, but the man with initiative will assume the place assigned to him and, because in consolidation there is a chance to demonstrate to those "higher up" qualifications for leadership, recognition will come.

Individual prejudices, however, can only retard the progress of consolidation temporarily. Finally, man prefers to live and enjoy comfort and luxury as second in control rather than captain a forlorn hope. If the economic reasons for consolidation are fundamentally sound and the benefits alluring, then the restraint of personal and social prejudice will avail nothing.

It is unnecessary to speculate on the possibilities of the future. Already there are existent numerous industrial consolidations that have grown through merger, all of which are operating along lines of "Big Business."

Consolidated forces may not prove comfortable for the individual, but it is more than likely to be

an effective stimulus for productive industrial performance.

It is possible for either the individual independent or the consolidated corporation to fail, but industrial history records indicate there is less chance for failure in well founded and honestly operated consolidations.

Formerly the elimination of competition and control of raw material sources were the objects of mergers. Now, the possibilities for profit-making by the merger of business, whose type and interests are allied, and the improvement of common conditions are primary reasons for consolidation.

The improvement of manufacturing processes and efficient production will follow as a natural consequence of consolidation under competent management and internal effectiveness.

The increased resources of money and ability, in addition, can promote and support investigations and research work which will develop and improve the product.

The era of industrial consolidation is opening up rapidly. The reasons are so potent that objections will be swept aside into oblivion when compared to the benefits to be derived. Economically, it is sound.

The combination of forces makes a solid foundation for new industrial enterprises which will operate, benefiting business and society, guided by the wisdom of industrial and commercial talents.

ADEQUATE TARIFF RECOMMENDED FOR CEMENT

THOSE who can visualize the world of tomorrow in terms of massive concrete structural piles in every city, concrete highways radiating from urban centers to rural communities, bringing like advantages to all, and the ever increasing building for the convenience and comfort of man can but partially forecast the demands that will be made upon the cement industry in the future.

The United States has led in the manufacturing of cement in the past, but if it does not take immediate and definite steps to protect American plants and workers by a suitable tariff, our leadership will soon be lost.

The financers and manufacturers of Europe are fully awake to the opportunity that exists at present.

Large and improved plants, such as the new Danish mills, the enormous installations that have recently been made in France, Germany, Poland, Luxemburg and Czechoslovakia, are being established in every country of Europe, where the manufacture of cement is possible.

Approximately only one-half of the cement manufactured on the continent is consumed by its own market and its problem is to dispose of the overproduction.

A powerful association, the Societe Continentale des Ciments, has been incorporated in Brussels, Belgium. This association originated in Warsaw, to seek an outlet for the great plants which are situated in Russian and Austrian territory but now a part of Poland and contributing largely to Polish national wealth.

With the idea of controlling the cement outlets more or less affecting the Polish properties a cerefully planned meeting was arranged and held during June, 1927, in Prague, at which were present representatives of finance and cement interests from Austria, Czechoslavakia, France, Germany, Italy, Spain, Great Britain, Poland and Denmark.

The economic union of Belgium—Luxemburg and its international guardian, France, reached an agreement protecting French territory from an influx of cement manufactured by her neighbors. Through a similar agreement, Holland, a large user of cement, was allotted to Germany in return for a promise that Germany would not seek to compete with Belgium-Luxemburg in North America.

It was definitely decided that the cement plants in the league should be kept running at capacity, to reduce overhead expenses to the lowest possible figure, and the over-production should be disposed of outside of Europe at actual cost or below if necessary.

It therefore becomes perfectly obvious that the main object of this cartel is nothing more or less than competition with the large mills of the United States.

Great quantities of cement from Belgium-Luxemburg come into this country, usually coming in as ballast and duty free.

With available figures at hand it is safe to predict that there will have been imported and sold in the United States during the year 1928, close to 3,104,000 barrels of cement approximately valued at $3,425,000.00. This will cost American Cement Workers 216,540 days employment and represents more than $1,414,910.00 in lost wages. In addition it affects Railroad, Mining, Textile and other labor to an extent of 300,540 days employment and $1,627,830.00 in wages. This will total a loss to the Cement Mills and their workers close to $6,500,000.00.

The American Commonwealth's welfare depends on satisfactory living and working conditions and it will not compete on a basis which will deny them the advantages now enjoyed, nor will it make the sacrifice necessary to meet such competition as now threatens the industries.

An adequate tariff duty on cement will check if not stop altogether these undesirable conditions.

MEN OF THE INDUSTRY

The portraits printed on this page in each number of PIT and QUARRY are taken from our files and their selection is without significance as to current events or as to the position of the individual in the industry.

John R. Morron

Mr. Morron is President
of the Atlas Portland Cement Company
of New York, New York

NEW PLANT OF OTTAWA SANDS CORPORATION READY FOR OPERATION

THE Ottawa Sands Corporation, a division of the Material Service Corporation of Chicago, recently completed a new and modern plant for the production of silica sand. The property borders on the north bank of the Illinois and Michigan canal about four miles west of Ottawa, Illinois, and is on the main line of the Chicago, Rock Island and Pacific railroad. Arthur B. Hewson, who is also vice president of the company, designed the plant in cooperation with the firm of Battey and Kipp, engineers, of Chicago. Mr. Hewson supervised the construction of the plant and H. A. Cooley the erection of machinery and equipment.

The plant was designed for a capacity of 3,000 tons per day and in a test run loaded a standard gondola railway car in eleven minutes. All buildings and heavy machinery have concrete foundations. Actual construction was started on September 1 of this year and the first test run was made on November 22. Actual production will begin about March 15, 1929. All of the conveyors, including the movable hopper and the shuttle loading conveyor, were supplied by the Robins Conveying Belt Company. The conveyor belts are all Hewitt gutta percha. Cutler Hammer starters and Square D switches are used throughout the plant.

The property consists of 79 acres, of which the deposit covers about 50 acres. The layer now being worked is 47 feet deep and is crude sand of a quality suitable for steel foundry moulding use. When this is exhausted there is available beneath it a deposit about 100 feet deep of fine silica sand which can be used for the washed and dried sand trade.

Shuttle Belt Conveyor Loading Into Cars.

Stripping is being done by private contract with a Moore Speed Crane 1 yard gasoline shovel. The overburden being removed averages 25 feet in depth and consists of about 18 feet of clay under

General View of Plant from Northwest.

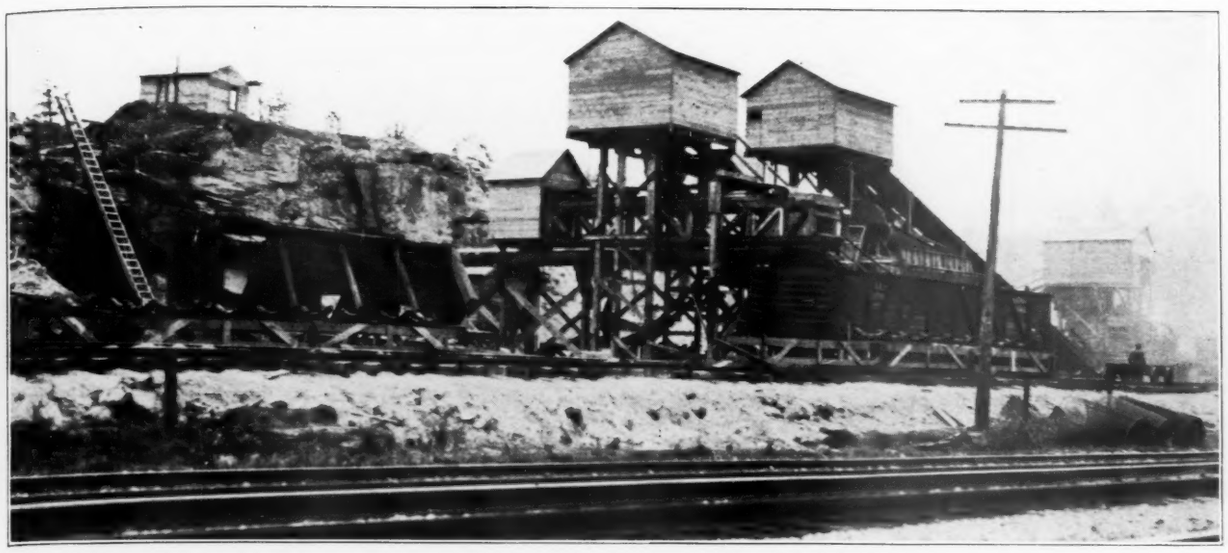
View from Northeast Showing Stripping and Drilling Operations.

which is a two foot vein of fairly good coal and about five feet of sandy clay before the sand deposit is exposed. The clay is removed in trucks and dumped near the west edge of the property, approximately 50,000 yards having already been disposed of in this manner. The coal is being dug by hand and is hauled by a cart to the edge of the cliff, where it is dumped into a wooden chute and piled at the bottom of the face. All of the fuel requirements at the plant are being filled by this coal.

The bank method of blasting is used, a Cyclone 5⅝ inch well driller driven by a 10 h.p. electric motor drilling the holes. Two Gardner-Denver No. 11 jackhammers are used to drill the large pieces broken down for secondary blasting. Compressed air for these jackhammers is provided by a Gardner 10 by 10 portable air compressor driven by a 30 h.p. electric motor.

The material is loaded by a Bucyrus 3 yard caterpillar steam shovel into a movable hopper travelling on rails astride a 36 inch field conveyor belt running parallel to the face. This hopper has a sloping rail grizzly with 15 inch spacing. The material is discharged onto the field conveyor by a Robins belt feeder operated through a ratchet by a 5 h.p. Allis-Chalmers motor. The belt feeder operates at a speed of 66 f.p.m. with a capacity of

View from Northeast Showing Plant Under Construction.

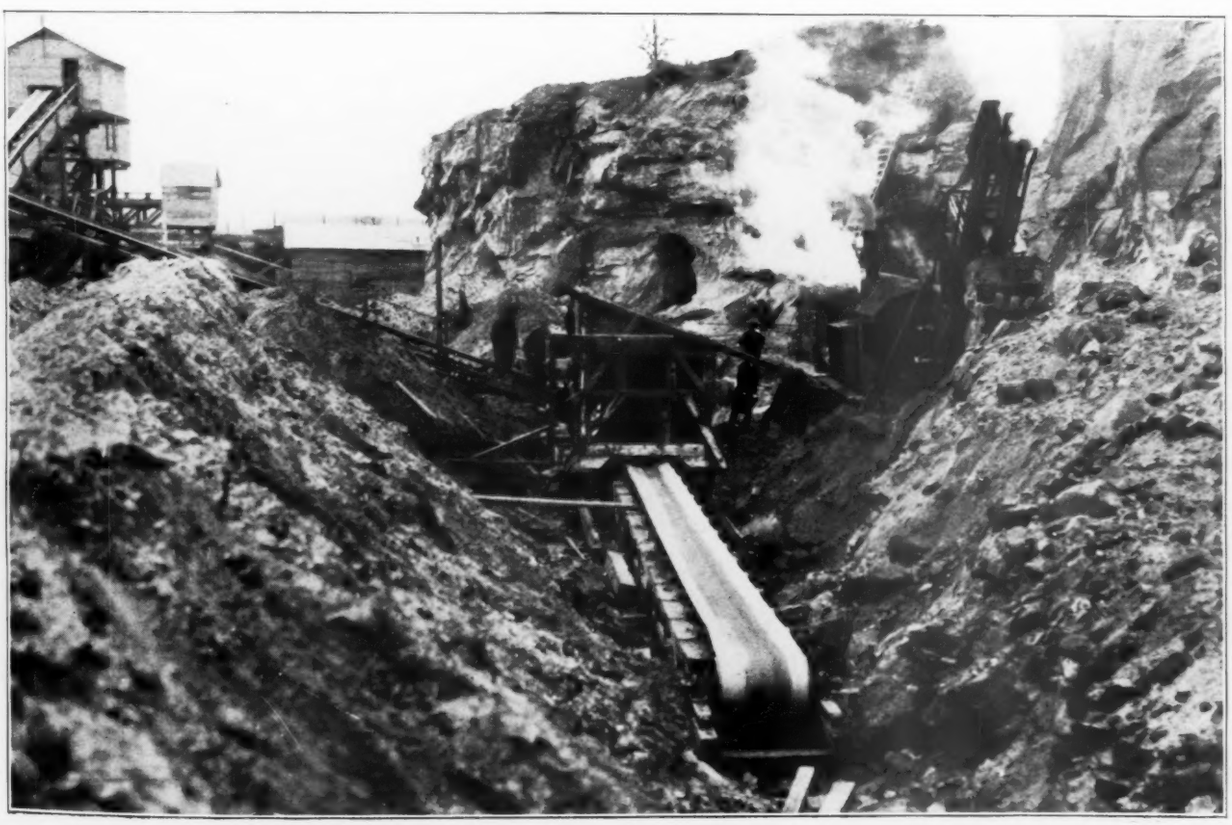


View of Plant from Southwest Showing Sidetrack and Rock Island Main Line Tracks in Foreground

300 tons per hour. The entire hopper and feeder are of Robins design. The field conveyor is only a short section at present, but will be extended with operations until it consists of two 250 foot sections. Each of these sections is to be driven by a 15 h.p. Allis-Chalmers motor through a gear and jackshaft drive at a speed of 167 f.p.m.

The field conveyor delivers the material onto a 36 inch inclined conveyor with a rise of 24 feet and 78 foot centers leading to the crusher house. The conveyor is at right angles to the face and discharges onto a bar grizzly with 4 inch openings. This conveyor is also driven by a 15 h.p. Allis-Chalmers motor located at the head pulley. The oversize from the grizzly goes to a 24 by 36 inch Portage Lake, Farrel type jaw crusher belt driven by a 50 h.p. General Electric motor. The crushed material and the throughs from the grizzly run into the same chute and fall onto a 30 inch inclined belt conveyor with a rise of 33 feet 6 inches, which carries it to the top of the screen house. This conveyor operates on 96 foot centers and is driven at the rate of 220 f.p.m. by a 15 h.p. Allis-Chalmers motor.

The conveyor discharges onto a bar grizzly with 1½ inch openings. The oversize goes into a Weller



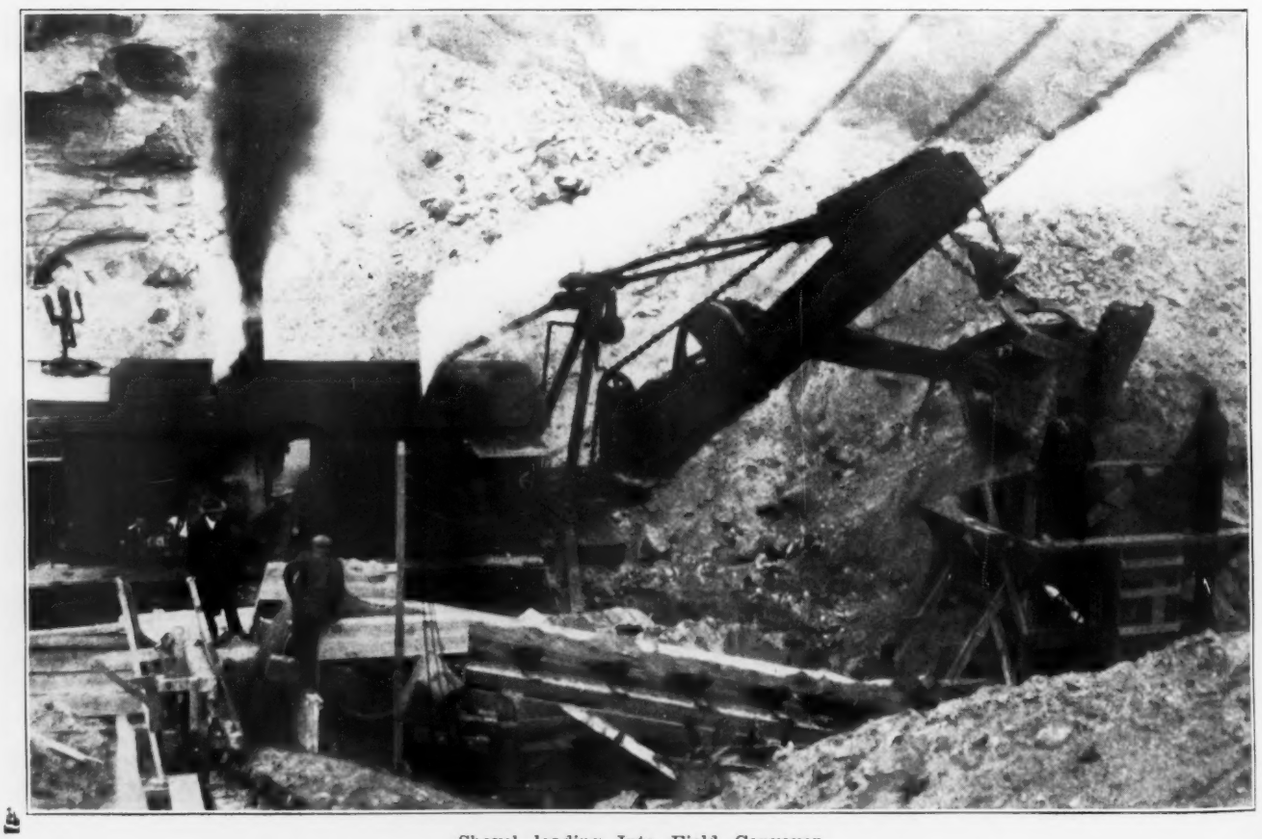
Shovel Loading Into Movable Hopper on Field Conveyor

Screen and Grinder in Foreground, Loader in Background

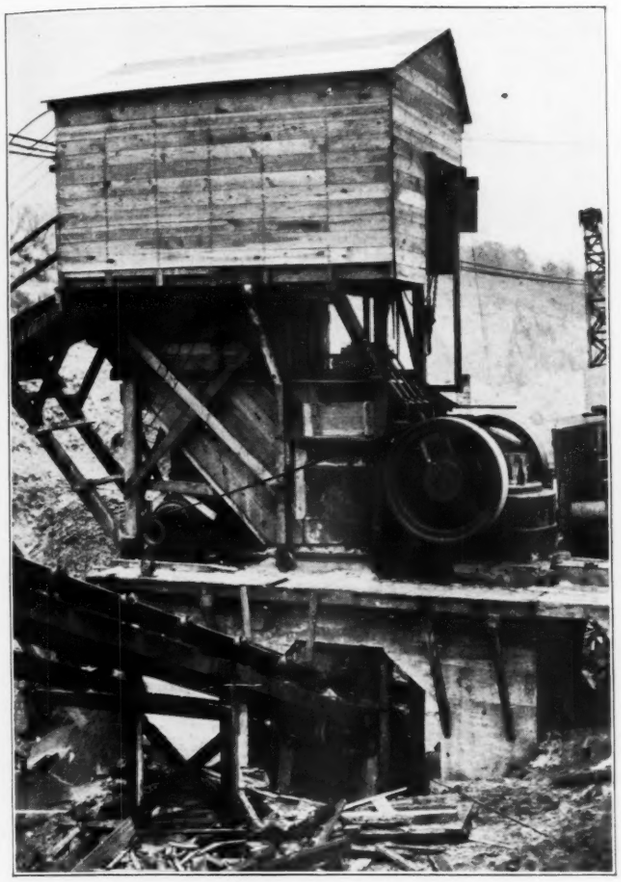
Manufacturing Company 4 by 16 foot revolving screen with ½ inch mesh W. S. Tyler wire sections.

Coal Mining at the Plant

The oversize from the screen drops into a Williams No. 5 roller breaker grinder driven by a 75 h.p. Gregory Electric Company motor direct connected through a flexible coupling. The feed roller and chute plate of this grinder are steam heated to facilitate the handling of wet sand in cold weather. A small upright boiler furnishes the steam. The revolving screen is belt and gear driven by a 20 h.p. Allis-Chalmers motor, which also drives the feed roller on the grinder through a chain and sprocket. The throughs from the grizzly, the throughs from the revolving screen and the discharge from the crusher all feed through separate chutes onto a 30 inch inclined belt conveyor with a rise of 22 feet leading to the top of the loading house. This conveyor operates on 62 foot centers and is gear driven at the rate of 220 f.p.m. by an Allis-Chalmers 15 h.p. motor. Discharge from this



Shovel loading Into Field Conveyor.



View of Crusher Building.

conveyor is through a chute onto a shuttle belt conveyor so arranged that it will discharge into cars on either of the tracks of the double track siding. This arrangement allows continuous loading, as one car can be moved while another is being loaded on the other track.

The shuttle conveyor was designed by the Robins Conveying Belt Company and has a 30 inch horizontal belt conveyor operating on 30 foot centers driven by a 5 h.p. motor at the rate of 225 f.p.m. The carriage runs on rails and is moved by a 2 h.p. General Electric reversible motor. Through a Jones spur gear speed reducer this motor operates a drum and cable arrangement by means of which the carriage can be moved in either direction.

A siding from the Rock Island main line has been built with a double track 1,700 feet long and 300 feet of single track. The siding has a capacity of 36 empties above the plant and 36 full cars below. The slope of the track is such that the cars can be moved to and from the loader by gravity. Later it is planned to install a car mover. Power comes into the plant from the Illinois Light and Power Corporation wires at 2,300 volts and is stepped down to 440 volts by transformers on the property.

This crude sand deposit has been worked by different parties using various methods over a period of 25 years, but never before on a large scale. One operation which took place about 20 years ago was of an unusual character. The coal mining method was used, two tunnels being run into the base of the cliff for a distance of 200 feet and another for about 40 feet. These tunnels were expanded to each side by the room and pillar method, the material being blasted loose and hydraulicked out to the loading machinery. These tunnels and rooms are still intact and should present an interesting blasting problem when operations reach this part of the face.

Structural Slate Investigations by Bureau of Standards

In connection with the general investigation relating to the physical characteristics of slate 41 samples have been tested representing the products from Arkansas, Maryland, Virginia, Maine, New York and four producing districts in Pennsylvania. The results of the usual physical test are summarized as follows:

	Highest	Lowest	Average
Modulus of Rputure (lb. per sq. in.)	12,000	3,700	7,600
Modulus of Elasticity (lb. per sq. in.)	17,000,000	9,000,000	12,300,000
Per cent. Absorption by wt.	1.41	0.06	0.34
Apparent Specific Gravity	2.88	2.69	2.77

Weathering tests are in progress which consist of frost resistance and acid resistance determinations. The freezing tests to date indicate that slate is very resistant to frost action. The acid test which is intended to simulate the action of rain water has shown a rather pronounced surface action on some of the slates, producing blistering and discoloration. This effect appears to be confined mainly to a thin layer at the surface since the average reduction in strength of the slate is only about 7 per cent.

Industrial Building Is Booming

The record in the building industry through September shows an increase in dollar value of over 7 per cent compared with 1927, itself a record year. The construction of industrial buildings forms a large proportion of the total and gives evidence of the business and industrial expansion which insures steady work for our wage and salary earners.

Automobile production, too, is most satisfactory. After a rather slow start, due largely to the fact that Ford was slow in getting under way, our totals have shot ahead until they are today practically 22 per cent ahead of the same period in 1927. During the past nine months 3,671,727 automobiles and trucks have been turned out by the manufacturers of Canada and the United States. Perhaps even greater is the significance of the fact that September production in Canada and the United States is 55 per cent higher than it was during September of last year.

SUDDEN GROWTH OF SMALL SAND AND GRAVEL PLANTS

By George Ransom

AN interesting development is taking place in the sand and gravel business to the northwest of Boston, largely in the town of Woburn. Until recently practically all of the sand and gravel used in this region had to be trucked a long distance, either from plants in another direction from Boston or from barge landing where the material is brought in from a still greater distance.

Considerable building and other contract work is being carried on around Woburn, Winchester and nearby places and as there are good gravel deposits available it is not strange that plants have come into existence. In fact, four have been equipped by the Good Roads Machinery Company and there are probably a dozen plants very close together, most all of recent development.

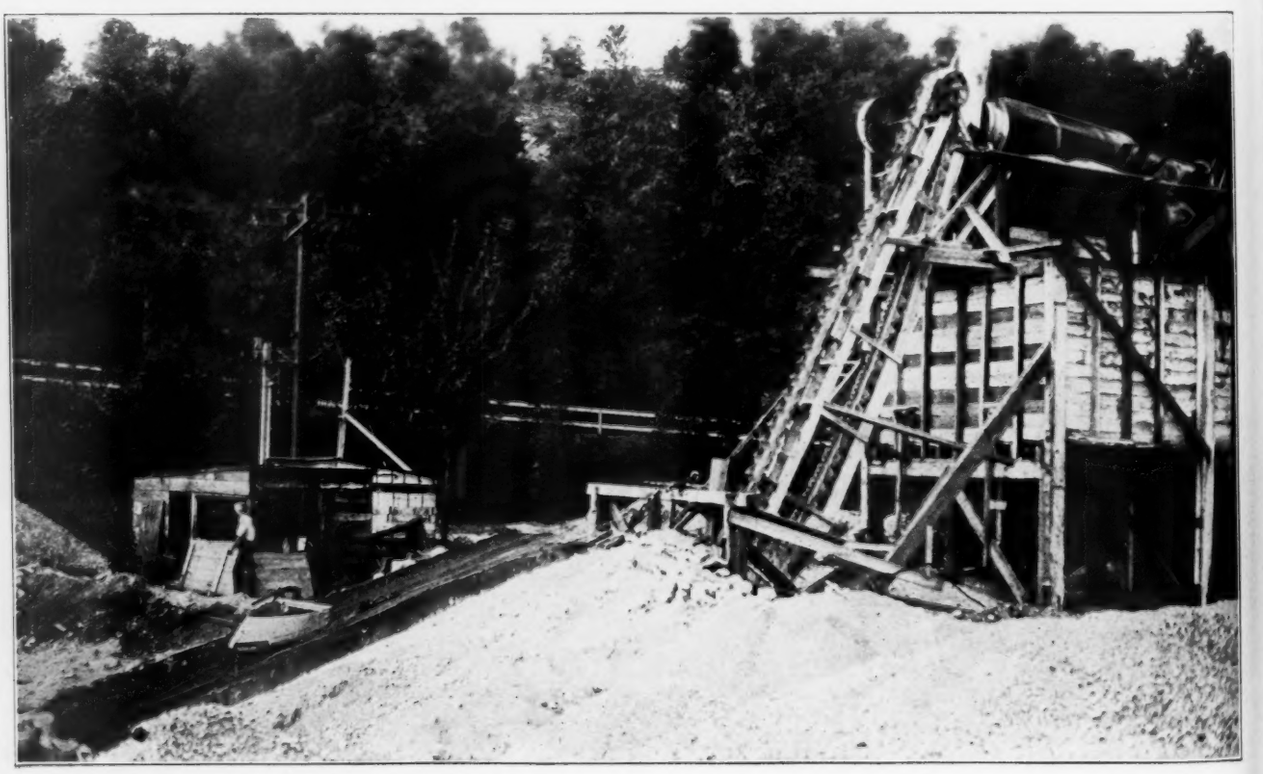
As already intimated, these plants are small ones but some of them, at least, have up to date machinery. Probably it is a justifiable assumption that they will make money, especially as their section of the country is undergoing a steady development. Just what the future has in store in the way of consolidations it is hard to say but that a remarkable growth is taking place in the sand and gravel industry here is plainly to be seen.

Two of these plants are directly adjacent. One is known as the Mystic Sand & Gravel Co. and the other by the name of its owner, Thomas R. Flynn. Both have just been built and both have been equipped by the Good Roads Machinery Company.

Mystic Sand Gravel Co., Scalping Screen at End of Scraper and Elevator to Sizing Screen.

Their different designs indicate just how much variation in machinery arrangement is possible and still maintain a high degree of efficiency working in the same type of gravel.

The Mystic Sand and Gravel Company has a



Thomas R. Flynn Plant View of Scraper and Elevator to Sizing Screen.

Thomas R. Flynn, Dragline Scraper in Operation.

Mystic Dragline Scraper in the Pit.

Mystic Sand and Gravel, Elevator and Sizing Screen.

belted two drum hoist, operated by an electric motor. The bucket is of the Crescent Type. From the point at which the material is discharged by the drag bucket, it is carried by a Champion steel flight apron feeder to a 30 foot by 4 foot long rotary scalping screen which by-passes all material under 2½ inches to the Good Roads elevator and discharges the oversize into a 9 by 15 Champion jaw crusher.

The crushed material is discharged into the same elevator as the scalped gravel. This elevator was changed over from an old type by new drives, back gearing on the head end, and the addition of Climax elevator idlers, with combination chain, making a smooth, free, and easy operating machine.

By the foregoing design, no material is carried directly to the main screen, which is a Good Roads roller supported and gear driven.

At the Flynn plant, which is managed by Murray Frazier, the gravel is brought to the feeder by a bottomless drag bucket, operated by a direct drive two drum hoist, with a special gear ratio and drum diameter to give the bucket a 200 foot per minute inspeed and 600 feet outspeed.

In this plant the feeder delivers the material directly to the Climax elevator. All the material goes through the main screen, which is an 18 inch long by 36 inch diameter Champion gear driven, with an eight foot sand jacket. Three grades of sand are produced. The pea stone is sluiced down a chute and put through a washing process.

Each of the above plants can produce 250 tons per day of 8 hours on average running and have produced in excess of this amount during rush periods.

Geological Survey Prepares Reports

The 200 field parties of the Geological Survey, Department of the Interior, which have been investigating the hidden mineral wealth of the United States and making maps of areas from Alaska to southern Texas, are now disbanding, with the end of the 1928 field season. Some of the parties are already back in Washington, and others are returning from day to day. All these field men from the Washington office, together with other Survey field men who have permanent field headquarters, and temporary seasonal assistants—rodmen, chainmen, teamsters, cooks, construction men, and others—form an aggregate force of not far from a thousand persons.

The Geological Survey's field parties consist of topographic engineers and their assistants engaged in making the great topographic map of the United States and in similar topographic engineering in Alaska and Hawaii, geologists engaged in investigating mineral deposits of many kinds in many different regions, engineers measuring and investigating water resources, and oil and gas and coal-mining engineers.

The geologic field work just being finished includes such diversified projects as studies of metal-mining regions in Montana, Idaho, Colorado, and Nevada, of coal fields in New Mexico and Montana, of phosphates in Idaho and potash in Texas, of glaciation in Pennsylvania and in the West, of deep-earth temperatures in California and the Rocky Mountains and Great Plains, of rock structure and the causes of earthquakes in New England, of lead and zinc in Arkansas, of the suitability of lands for inclusion in national forests in various areas, of microscopic fossils in Texas, of extinct volcanoes in New Mexico, of building stones in Indiana, and diatomaceous earth in Washington.

The leaders of the geologic parties that have been engaged in this work will now analyze their notes, prepare their maps, make the necessary laboratory studies, search the existing literature, and prepare for publication the reports, the chief means by which the results of their work are made available to the public. This is the usual seasonal phase of the annual routine followed in the Government's geological operations. During the summer the specialists are scattered from the Atlantic Coast to the Pacific, gathering at first hand and by personal study the facts upon which their reports are based.

During the last year some of the more important projects covered by the topographic parties of the Geological Survey were river surveys for the Army Engineers in Illinois, Mississippi, and Wisconsin. Other projects that will have a popular appeal, especially in the East, are the continuation of the mapping of the proposed Shenandoah and Great Smoky Mountain National Parks. The geographic extremes of topographic mapping in the United States proper during the year ran from northern Maine to the Olympic Mountains in Washington, and as far south as central Mississippi. During the coming winter there will be some surveying in Cameron County, Texas, near the mouth of the Rio Grande. The topographic mapping this season has been assisted by aerial photography by the Army Air Corps in the Connecticut River Valley and along the Kankakee and Sangamon Rivers in Illinois. About a thousand square miles were photographed by airplanes. A few topographic engineering parties will carry on during the winter in Oklahoma, Texas, Arizona, and California.

Alaska had seven geologic and topographic parties in the field this year. All have returned to Washington from widely scattered areas in the Territory. No specific statement of the scientific results of the Alaskan expeditions can yet be made, as much laboratory and office work must be done in analyzing the field observations, perfecting maps, and testing the soundness of the conclusions. The season's work included some 6,500 square miles surveyed—2,500 topographically and 4,000 geologically. With the completion of this work between 40 and 45 per cent of the entire area of Alaska has been surveyed both geologically and topographically, though it is stated that there still remains unsurveyed an area of nearly 200,000 square miles.

Highway Technical Conference For Peru in 1929

By a supreme resolution of October 5th, the Executive Power has called a Technical National Conference, to be held in Lima on October 5th, 1929. The Conference will be attended by all engineers engaged in highway construction and all those who may be acquainted with the subject. The purpose will be to supplement the Government's plan for road construction with such experiences as have been acquired in practice and to discuss the results obtained from the application of the Road Conscription Law. (Commercial Attache O. C. Townsend.)

WHAT SAFETY MEANS TO A QUARRY EXECUTIVE

By John Rice*
President, General Crushed Stone Company, Easton, Pa.

I AM going to talk to you very informally without burdening you with a lot of statistics, first because they are uninteresting, and second because the General Crushed Stone Company with which I am connected has not been practicing scientific safety methods long enough to make comparison with past performance illuminating.

Perhaps my personal experience outlining the gradual evolution of thought about safety is quite typical of the growth of the movement among executives and students of human engineering generally, and this is my excuse for using it as the basis of this address.

There was a marked contrast in the relationship of the employer and employee during the past seventy years with the antecedent time. In the early days before the time of large corporations employers were individuals or partners directing a comparatively few men. Prior to the Civil War much of the work was done by slaves and bond servants. The more intimate contacts and simpler character of the service performed together with the fewer number of individuals involved in the first instance and the self-interest inherent in slaves and bond servants in the second instance did result in some personal interest in the welfare of labor.

However, with the growth of corporations, with no personal contacts between executives and large aggregations of labor, with the introduction of machinery, with the opportunity to replace the waste due to accidents, sickness and death from emigration and from a prolific native stock, with the fierce struggles of pioneering business enterprises for financial success regardless of ways and means, little heed was given to the welfare of employees from a humanitarian standpoint and no conception of the waste from an economic one.

My personal executive experience covers a period somewhat over forty years. The first ten years was for the most part devoted to general contracting and I was in quite close contact with my men. I was not by nature very hard hearted and had an emotional sensitiveness to human suffering, but I can not recall that I had any great concern about my men's welfare or safety and certainly no well defined policy or principle concerning it. Employers liability insurance covered the risk and that was all there was to it.

During this period, however, I became aware of the instinctive willingness of men to risk life and limb, when by reason of some accident or other untoward circumstances, structures, machinery or property of any kind were in jeopardy, by rushing to its rescue regardless of the danger. It was also quite obvious that men often took unnecessary, perhaps reckless risks, in the regular course of their work to expedite its accomplishment which otherwise would frequently have added to the cost of same. What I am emphasizing here is not my approval or admiration of such conduct but the evidence of men's willing cooperation notwithstanding the danger and resulting physical penalties.

Under the then existing law, drawn largely in the interest of the employer, the defense of contributory negligence and the act of a fellow workman were usually adequate to deprive a workman of any redress for accidents sustained by him.

In view of my observations just presented this seemed a rank injustice and led me and my associates to abandon the carrying of liability insurance when in connection with a contract for ballasting the Lehigh Valley Railroad, we entered into the crushed stone business about thirty years ago. We set up a reserve approximately equal to the insurance premiums and paid the men from this reserve for their expenses and lost time resulting from accidents on the theory that a business ought to be charged with this expense and not the men themselves. Parenthetically, this was of course the grounds for the passage of the later Workmen's Compensation Acts.

Whether as the result of this policy of intended justice and fairness or not, it is interesting to note that we have never had but one lawsuit with any of our employees as the result of an accident and that one we won.

As a further evidence of added and growing interest in our men some ten years ago, we inaugurated a profit sharing system through which our men ratably benefit in our success.

Moved by a continued regard for the well being of our men, a few years ago we effected a plan of group insurance carrying from $500 to $1500 per capita according to a wage classification and paid for by the company, further increased by a plan which is partly paid for by the men themselves. This group insurance now amounts to nearly $1,000,000.

The purpose of reciting these acts of modest generosity or enlightened selfishness as they may appear is not to exploit our virtues but to point out

*Presented before the National Safety Congress.

that notwithstanding a fairly well advanced theory of the relationship of employer to employee during all these thirty years, not until within the last three or four, did we even give any study or analysis to a definite policy of systematic safety from a humane or economic standpoint. We really gave little thought as to how and why accidents might and should be avoided. It was to the persistent efforts of those interested in the National Safety Council which awakened our vision to the fact that we were overlooking a matter of great importance which was doubtless quickened by our recent adoption of the plan of self-insurance instead of through the various insurance companies otherwise required by law.

We began a thorough study and research in this movement with the result that we formed a definite organization charged with the responsibility of carrying these theories into practice.

This plan consists of a general committee made up of the executives and assistants in the main office together with a new officer entitled Supervisor of Insurance and Safety. At each plant is established a committee with the superintendent as chairman. These plant committees meet frequently to confer with the main office committee and also locally to discuss practices and plans. At some plants they meet in the evening to avoid distraction by their current duties, being allowed their regular hourly rate of pay as though at their regular jobs. This has the effect of making the men take the purpose more seriously and thoughtfully.

Of course, one of the greatest difficulties is impressing the men with the seriousness and importance of the work. Their first reaction is that they can take care of themselves and resent the suggestion of a nurse's solicitude for their welfare. Upstanding two-fisted men like to take a chance, they like the dramatic, the sensational and as I have already observed there is an instinctive impulse to do the helpful thing regardless of danger to themselves.

However, the appeal to them that the idea is not born of a maudlin sentimentalism, but on the one hand to avoid suffering and loss to them and their families and on the other hand the loss to the company through the displacement of a skilled or trained employee, the direct expense of the accident through compensation and the indirect loss due to stoppage of work and demoralization of other employees.

One method of arousing and holding the interest of the men is posting on a conspicuous bulletin board the striking posters of the National Safety Council. In order to further attract the men to these posters we have subscribed to a news service which gives the latest information as to events most likely to interest men of our class, similarly posted on the bulletin board. By their inspection of the lessons borne home to them by these posters, they are influenced by the injunction of the Pennsylvania Supreme Court to "Stop-Look-Listen."

It is but a step to further impress upon the employees the necessity and desirability of prevention of accidents to machinery and property as well as to the life and limb.

The constant dwelling by the committees on all phases of these questions develops in them secondary ideas such as neatness, order and forethought. It results in a place for every thing and every thing in its place. As leaders learn, others follow. The best way to learn is to teach.

Neatness reduces fire hazards by the practice of gathering up inflammable material and having a safe place to dispose of it. Cleanliness of machinery often discloses latent weaknesses which otherwise is only ascertained by a breakdown.

A questionnaire to our superintendents as to the effect of the movement, discloses in their judgment a distinct improvement in the morale of their men, a greater interest in their work and many resulting economies.

As one of them expressed it, they have all come to realize that a trained man on the pay roll was a lot more valuable than on a compensation list.

There is a growing and increasing belief by the men that the company is really interested in their welfare, not sentimentally or piously but sensibly and wisely.

It is interesting to note that in the Safety competition inaugurated by *The Explosives Engineer* under the auspices of the United States Bureau of Mines for such quarries in the membership of the National Crushed Stone Association as entered the contest, our White Haven plant won that trophy for 1927, not having had a lost time accident for eighteen months. Our Winchester plant during July had only forty-five minutes lost time as the result of accidents of any nature whatever, men or machinery which is an admirable record in our experience.

I can not reduce to dollars the resultant benefits of this intensive safety movement on our part but I believe it is no exaggeration to say it has effected a saving of ten per cent in our operating expenses and thirty per cent in our accident expense.

The movement is humane, economical and profoundly wise from any point of view and speaks well for the vision, labor and persistence of those pioneers of the National Safety Council in so earnestly keeping at it until it has become impressed upon most executives as a necessity to industrial progress.

BYRON SAND AND STONE COMPANY OPERATES DURING ENTIRE YEAR

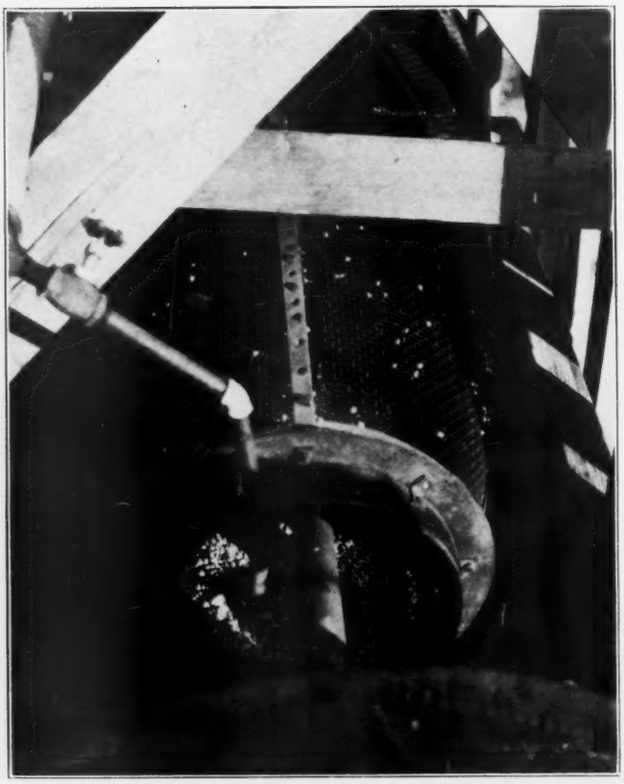
THE Byron Sand and Stone Company operates a sand and gravel plant at Byron, Illinois, which is distinctly a family affair. In addition to this plant, a small limestone quarry nearby is worked for agricultural limestone and road stone. A cement products plant next to the sand and gravel plant is also operated from time to time as demand requires.

Previous to last summer sand and gravel was excavated from the pit by a ½ yard drag scraper which dumped into screens in the pit. The screens discharged directly into trucks for delivery. The new plant, which had been under construction for some time and has a capacity of 24 cars in a 10 hour day made it necessary to install a new excavating system. A Sauerman slackline cableway excavator with a 1½ yard bucket, supported by a 100 foot timber mast was installed early in the fall. The cableway has a span of 650 feet and is operated by a Thomas two drum two speed hoist driven by a General Electric 125 h.p. 2300 volt electric motor. This power is taken direct from the wires of the Northern Illinois Utility Company. A transformer steps the current down to 440 volts for the other plant operations.

The bucket dumps into a hopper at the top of the plant and feeds by gravity into two Link Belt conical screens with 1½ inch perforations. These screens are the first of three pairs of screens operating on two parallel shafts both driven by a 15 h.p. motor. The oversize from the first pair goes to a Link Belt scalping screen with 2 inch perforations driven from the same motor. The oversize from the scalping screen, averaging about 3 per cent

Bucket Lowered During Suspension of Operation

View of Plant Showing Conveyor and Weigher at Left



One of the Sizing Screens

of the material, goes to a Universal 9 by 16 inch jaw crusher driven by a 10 h.p. Fairbanks-Morse electric motor. The crusher discharges into a Jeffrey chain bucket elevator with 6 by 10 inch buckets which delivers the material back to one of the first pair of conical screens. The throughs from the scalping screen go direct to the first of 5 bins under the plant as 1 to 1¾ inch stone.

The throughs from the first pair of screens go to the second pair which have ⅝ inch mesh wire cloth jackets. The oversize here goes to the second bin as ⅝ to 1½ inch stone. The throughs go to the third pair of screens which have ¼ inch perforations. The oversize from these goes to the third bin as ¼ to ⅝ inch gravel. The throughs feed onto two galvanized iron chutes leading to two Link Belt sand settling tanks. Perforations in the bottom of the chutes allow the fine sand to separate out into two more settling tanks of the same make. These tanks discharge into 2 bins, one for torpedo and the other for fine sand.

A jet of water is played into each screen giving a thorough washing. This water is pumped from a 4 foot well 70 feet deep adjacent to the plant at the rate of 600 g.p.m. by a Fairbanks-Morse 35 h.p. vertical motor driving a turbine pump with a 7 inch intake and 8 inch discharge.

Each of the bins has a capacity of five carloads and has three Telsmith gates, one discharging into cars on the siding, one to trucks and one to a 24 inch Weller belt conveyor in a concrete tunnel under the bins. This conveyor, which operates on 166 foot centers and is driven by a G.E. 15 h. p. motor discharges into a Markman 1 ton automatic weigher which discharges by Telsmith gates into either cars or trucks. This conveyor can also be used for stockpiling any desired size of material.

Plant View Showing Stock Pile Chutes at Right

The receiving hopper at the top of the plant is so arranged that pit run gravel can be chuted directly into cars or trucks. Chutes are also arranged under the screens so that any desired size of gravel or sand can be chuted out into stockpiles. A small gasoline driven stockpile loader rehandles this material.

The property on which the plant is situated consists of 143 acres, 83 of which contain the sand and gravel deposit and the other 60 acres crushed stone. The gravel deposit averages about 60 per cent gravel and 40 per cent sand and is estimated to be about 100 feet deep. W. H. Ashelford operates the plant in partnership with his two sons W. J. and Herman. The father handles the sales and clerical work while his son Herman is in charge of the plant. W. J. runs the hoist. Four other employes help out during the summer months.

Carload shipments are made over the Chicago Great Western which has a ¾ mile sidetrack to all three of the operations, and over the Chicago, Milwaukee, St. Paul and Pacific railway. Shipments of sand and gravel for concrete and road work are made within a radius of 100 miles. A

(*Continued on page* 50.)

CUTTING DOWN LABOR WASTE

By H. W. Munday

WASTE of any kind in industry is a vital problem to the executive. To cut down waste is his constant aim. Every investigation of labor turnover reveals points of waste. The expense of hiring, of adjusting the worker to his job, and of training him in efficiency must be repeated with each new man. Accident occurrence is twice as frequent during the first months of employment. Waste from lost speed and from poor work is greater with new men. New employees require more supervision than seasoned laborers and hence bring a higher overhead. Every employee who leaves takes with him something of value in the way of knowledge or special skill which is the result of valuable training. Such losses cut in on profit. A scientific investigation will determine exactly what the loss is in dollars.

This waste of labor turnover is often overlooked in organizations in which there is little standardization. A badly managed plant is not greatly disturbed by labor turnover. In such a plant there is often so great a variety of wastes that this one is scarcely noticed. In plants where there is a good system of training and well planned methods of production there is greater cost involved in change of workmen. When efficiency prevails, the cost of labor turnover increases in direct proportion with that efficiency and is taken into account with other costs that must be controlled. The employee in a well managed plant has increased his knowledge and has required more time in training and therefore takes away more than the employee in a poorly managed plant.

Numerous methods have been tried at different times to reduce turnover, but unless these efforts have been based on sound principles of scientific management, they have been doomed to failure. Amusements such as movies, sports, etc., have been used; petting and coaxing have been resorted to; and appeals to loyalty and high principles of ethics have had a temporary effect. These experiments are all tried out for one purpose and that purpose

A Team that Added Much to the Credit of the Company

A United States Gypsum Basketball Team

is a good one. Every executive knows that he must build up a good morale, a plant loyalty, a spirit of team work if his organization is to function efficiently. In the old days a notion prevailed that it required some sort of mysterious gift to sesure this spirit of loyalty, but that theory has been exploded. That seemingly intangible thing called morale has been analyzed; its elements have been classified; and methods of creating it have been determined.

Sports have been used with surprising effect by many in developing and maintaining a spirit of loyalty and friendship within an organization. We have known of baseball and basketball teams that have created a good deal of goodwill for a company throughout a large community and even through a district. In addition to baseball and basketball, teams can be organized for inter-department or inter-company competition in bowling, tennis, swimming, handball, billiards, checkers, chess, etc. Both indoor and outdoor sports as well as physical and intellectual activities can be provided with little cost and great profit in loyal, enthusiastic and cooperative employees.

The first requisite of good teamwork in a plant is a permanent group. There cannot be a sound feeling of mutual service, of obligation, or of loyalty in a constantly changing personnel. Statistics show that labor turnover ranges from 100 to 200 percent annually. In other words, more persons are hired in each industry during the year than are working at any one time. It is worth while for any executive to determine what percent indicates the relation of the number of employees hired annually to his average permanent force. The rate of turnover is considered a fairly accurate standard of business efficiency. When labor turnover reaches 200 percent annually, the waste is equivalent to that resulting from a strike. The disorder is spread over the entire year, but the loss, if estimated, would undoubtedly equal that of a strike of several weeks' duration. It is with a permanent group that plant loyalty can be maintained.

The best way to reduce turnover is to operate under efficient management. There is no desire on the part of most employees to have high turnover. Their best interests lead them to prefer perma-

A United States Gypsum Baseball Team

nent jobs. Hence the causes of turnover should be determined and dealt with scientifically. If it is found that a large percentage of turnover is caused by dissatisfaction with wages, it is an indication that the wages paid are below the market rate and that the employees who are retained are too inefficient to command the market rate. Scientific management cannot prevail with a uniformly inferior group of workmen. Therefore a study of the wage situation will be a part of a program of economy.

If sickness is a cause of high turnover, it is possible that some simple changes in working conditions may take care of the situation. If there are many cases of employees being discharged because they are incompetent or insubordinate, it is advisable that the chief executive give consideration to his minor executives. A mistake in the placing of a foreman may bring an unnecessary and expensive turnover, while a shift of places may result in more satisfactory conditions for all concerned. While there are conspicuous exceptions to the rule, it is safe to assume that every man in the organization from the highest subordinate to the most ignorant workman prefers to be successful in what he is doing. It is the responsibility of the executive to have his men so placed that they are of the greatest value to him. This occurs when they are placed where they work with most satisfaction to themselves. Hence all supervision and discipline should be of such nature as to build up plant loyalty.

A sure method of reducing turnover is to create a pride in the product. Interest in the work comes with knowledge of the results of the work. Employers who keep their employees informed as to the importance and good quality of the product which they are producing are well repaid for their efforts. Executives who spend lavishly in order to build up good will in the market will be wise if they also give some thought to advertising the product among the workmen. An employee likes to boast of the firm for which he works; he enjoys being enthusiastic about its standing among other members of the industry. He has a personal pride in up-to-date equipment; he gets great satisfaction out of a new and powerful machine. The installation of a new piece of equipment which is the latest model is a matter of personal satisfaction to the men who operate it. It means to them that their product will be second to none on the market. Their pride in that product will be measured in the profits of the business at the end of a year. They will not be quick to leave a plant that they think of with pride.

A permanent group producing a commodity in which they are interested will build up traditions. No factor will be more effective in reducing turnover than solidarity based on traditions. A group of workmen during a noon hour entertaining themselves with the immortal, "Do you remember

A Typical Cement Plant Club House

when" stories, will be held together by their pride in the past. There was the time when a production record was broken, when an accident was averted by some one's thoughtfulness, when an unusual occurrence resulted from a blast. There are also humorous things to be remembered and talked over. Traditions weld the group together and keep them on the job. All are factors in eliminating the waste of turnover which is an unnecessary waste. And all reduction of waste proves its worth when the financial reckoning comes at the end of a year.

American Road Builders to Meet

More than 30,000 people will be present at the 26th Annual Convention and Exposition of the American Road Builders' Association, which will be held in Cleveland, January 14-18, 1929. This attendance will comprise highway engineers, officials and contractors from all states in the Union, as well as representatives and delegates from 28 foreign countries. The program of the convention will consist of the reports of the various committees appointed from the seven Divisions of the Association.

On City Officials' Day, Captain H. C. Whitehurst, assistant to the Engineer-Commissioner of Washington, D. C., will preside. The program will comprise the reports of the Committee on Administration, Organization and Finance; the Committee on Design and Construction of City Pavements and Streets; the Committee on Maintenance of City Streets, and the Committee on Traffic Control. A special committee appointed to study subgrades and pavement bases in cities will make a report.

On Pan American Day the program will be in charge of the Pan American Division. Thomas H. MacDonald, chief of the Bureau of Public Roards and Octavio Dubois, president of the National Highway Commission of Mexico, will act as co-chairmen of the session. Papers will be presented by delegates from the Pan American countries, setting forth the interesting facts of the road activities in their respective countries. A complete description of Federal highway construction in Mexico; a resume of the road activities in Canada and the financing of the system of roads in Chile.

On County Highway Officials' Day, the program will consist of the reports of committees made up entirely of county highway officials and covering County Surveys and Planning; County Highway Construction; Rural County Highway Maintenance, Urban County Highway Maintenance; County Highway Legislation; County Administration; County Construction and Maintenance Equipment, and County Highway Finance. There will also be a special paper on the "Procedure for making an Economic Survey and Plan for County Highway Development." A special committee on Grade Crossings, headed by E. W. James of the Bureau of Public Roads, will present its report.

Special headquarters will be established at the Convention and Exposition for the State Highway Officials, County Highway Officials, City Officials, Highway Contractors, Engineers and Officials, Manfacturers and Pan American Divisions and the delegates are invited to make use of the headquarters thus placed at their disposal.

The annual Road Builders' Banquet will be held in the Hollenden Hotel on Wednesday evening. Special features have been obtained to make this banquet highly interesting and an outstanding event.

The Road Exposition will be the largest of its kind ever held. Over 500 carloads of the latest improved road building equipment and materials, occupying a space of almost 8 acres, will be on display for inspection and comparison. The railroad companies have again granted reduced railroad fares to the convention. This reduction is based on the certificate plan and enables the delegates to obtain their return railroad tickets at one-half the price.

(*Continued from Page* 46)

White 5 ton truck and four Ford 1 ton trucks are operated for local delivery.

The quarry is operated only during the winter months where the sand and gravel plant is shut down. The output will run about 150 tons per day, most of the stone being used for agricultural purposes and some for road work. A portable crusher made by the Williams Patent Crusher and Pulverizer Company is the chief item of equipment in the quarry.

The cement products plant is operated from time to time when other operations are slack and whenever orders require. Aggregates from the gravel plant are used. The major part of the output is cement block and drain tile. Roof tile and stock watering troughs are also made.

SOWING SEEDS OF SAFETY IN THE MAJOR DEPARTMENTS OF A COMPANY

By Henry A. Reninger*
Special Representative, Lehigh Portland Cement Company, Allentown, Pennsylvania

TWENTY years ago safety in industry was practiced by very few concerns. Ten years ago the National Safety Council was becoming established and known. Many people, even at that time, felt that safety was a theory and not practical, but the Compensation Laws compelled them to make necessary revision in equipment and design, to guard the dangerous parts of machinery which had in the past been responsible for many serious and fatal injuries. Large sums of money were spent, and while accidents were reduced they were not reduced to the extent which had been looked for and we began to realize that the guarding of machinery was not the most important part of safety work. The education of the executive, department heads, superintendents, foremen and employes, was the big problem.

In giving you this informal talk I, perhaps, am bringing out some of the problems that I ran up against in my own organization, but I believe they will be of interest, for it will give you a general idea of what group plant supervisors are up against in a fair sized corporation, with plants scattered in various parts of the country.

We had more or less carried on safety work and had organized committees in 1915. From 1916 to the end of the war there was no general supervision of the work, but the safety committees functioned and did certain jobs, as protecting and guarding machinery and complying with any rules and regulations issued by the insurance company or State inspectors. However, the results had been more or less unsatisfactory and after the war, upon my return, I was told to carry on this work and organize it and see whether we could not cut down the toll of accidents which cement plants were then having.

Perhaps the simplest way to get a department started is for the president of the corporation to issue a letter to all departments and plant superintendents, announcing the creation of a safety department and instruct all departmental heads to cooperate. By so doing all officials know that this work is approved by the head of the organization. From then on it is the duty of the safety director so sow the seeds of safety among all departments and persons directly affected by this new program. It means that the safety director must keep a full and complete record of all accidents and the cause of the same; that he must put this information in such shape that it can be read by the chief engineer, the executive officials of the company, plant superintendent and department heads.

Sowing seeds of safety can be done in many ways and I don't believe that just the sending of reports to these various officials is the best means of bringing this to their attention. Personal contact with the various department heads and executives, the telling of the story of an injury to an old employe or the fact that an employe was killed, leaving his wife and several children to be taken care of by others.

Naturally the treasurer or comptroller of a company will be interested in safety from the financial standpoint and reports showing cost of accidents, cost of compensation insurance, etc., will interest him because that is his particular duty.

After years of experience we are able to compare one year's cost with another and where you show a saving and accumulate a surplus they will begin to realize that safety is not a fad but is a real saving.

How can we interest the principal departments in a big organization? The Enginering Department, for instance, I find that the material of greatest interest to the Engineering Department is reports and charts showing accidents, days lost; also man hours and days lost per 100,000 man hours with a curve showing production.

A ten-year report that has just been worked out showing all these figures has proven very interesting not only to engineering but to all departments. However, reports of this kind do not mean very much to sales, traffic, advertising, and they must be reached in a somewhat different way. Our Engineering Department appreciates reports and charts and it is also the duty of the Department of Safety to keep them advised on any new laws and regulations in various state departments; to furnish them with copies of any new codes. Our Engineering Department receives a copy of every Safe Practices Pamphlet issued by the National Safety Council, and we find that they make use of these safe practices many times in the designing and construction of new buildings. We also keep them advised in regard to anything new in the way of fire protection and fire prevention. Any new inventions that will improve the safety of any machinery in use are also furnished to the department.

In regard to the Purchasing Department, we also try to keep them advised of anything that is new and the Engineering and Purchasing Departments

*Presented before the National Safety Congress.

work with the Department of Safety in seeing that new machinery being purchased has all the proper safeguards. Any help that the safety engineer can give to any of these departments is appreciated, and after gaining the confidence of these departments you will be called in from time to time to make recommendations.

The Traffic Department's interest and cooperation was aroused through the report of the Safety Department showing the number and bad order in which cars were received at the various plants and which were hazardous in unloading. Every accident, where a man is hurt in unloading cars due to faulty equipment, is referred to the Traffic Department, and this report, through them, is forwarded to the railroad. By having our Traffic Department take an active interest in this work we find that the rolling stock coming into our plants from the mines is in better condition than ever before.

The Sales Department, in many ways, has no connection with the Safety Department. They are employes who are not exposed to the hazards of a plant and their main job is in selling. However, they recognize the Safety Department for the simple reason that every employe's registration card must be made out and sent to the Department of Safety, who also handles personnel records. Interesting bits of information are sent to them from time to time. Every salesman on the road driving a car was furnished with a set of Safe Driver's Practices, with a letter accompanying the set advising them that, at the request of the vice president, this was being forwarded to them for their information and study. All accident reports, of course, are handled by this department and all minor injuries to office employes are treated in the department; all departments call upon us in emergency cases, whether sickness or accident.

When the class of student salesmen were about ready to go out on the road and to spend a certain number of weeks in dealers' yards, the Sales Department asked our help and to talk to these men on the hazards they would run up against in the material dealers' yards. We were only too glad to give them a forty-minute talk, and found all of the salesmen very much interested in the subject, so much so that many of them have written in for further information on the subject of safety, fire prevention and housekeeping in yards.

The handling of all accident reports for the salesmen on the road has tied in these men, with the result that, from time to time, this department is able to render a service here or there for them and receives due recognition.

The personality of the safety director must be such that he is on friendly terms with all officials and department heads and he must take advantage of every opportunity to tell the officials interesting stories of things happening in and around the plants. This must be done in such a way that it does not become tiresome. He must have at his fingers' ends the facts and figures—number of man hours worked, number of man hours lost, cost in dollars and cents; also the amount of savings. He must remember at all times, however, that these various department heads have problems of their own. The superintendent and manufacturing departments have their daily problems and safety is just another one that is added to the burdens which they already have; therefore, he must sell this idea in a way that will bring them to feel this job is one that must be done, not under compulsion, but because they have been shown it is of benefit to them in their production work. He must not assume the attitude that he can command attention and conformities to the rules because the chief executive has issued an order that safety must be carried on—if he does he will not get very far.

The chief engineer, the chemical engineer and the sales manager are not hired to help the safety director—they are hired to work out their own problems and carry on their own work, but it is necessary that the safety director so interest them in his department that they will be only too glad to work along with him.

Sowing seeds of safety is like sowing seeds on a field with a very high wind blowing. They do not always land where they are intended to, but are scattered sometimes to the four winds and many times take root and grow where least expected.

There is no question in my mind that the safety director has one of the most difficult jobs in a company. He must show the Sales Department that safety helps them in selling the product.

Accidents are expensive and they do not make profits for the company. Many companies do not know the cost of accidents because they do not keep accurate records, but where these costs are known and by safe practices accidents are prevented, the work of the Safety Department is shown to be a benefit to the company in a financial way and its recognition is assured.

When a report can be shown where a plant was spending from five to ten thousand dollars for compensation, medical and hospital each year for a period of five years, and then for the following five years a report shows they only had three lost-time accidents, with one compensation case, with the saving running into tens of thousands of dollars, all department heads will sit up and take notice.

There is no question in my mind but that in every organization we have different problems—different types of department heads to handle, and every safety director must work out his own problems. Every safety director must be a lifter, not a leaner. It is his job to be of help wherever possible to any department at all times; the less favors he asks and the more help he can give, the better his reputation with the various departments.

ILLINOIS GRAVEL PLANT NOW UNDER CONSTRUCTION WILL DELIVER MATERIAL BY BOAT

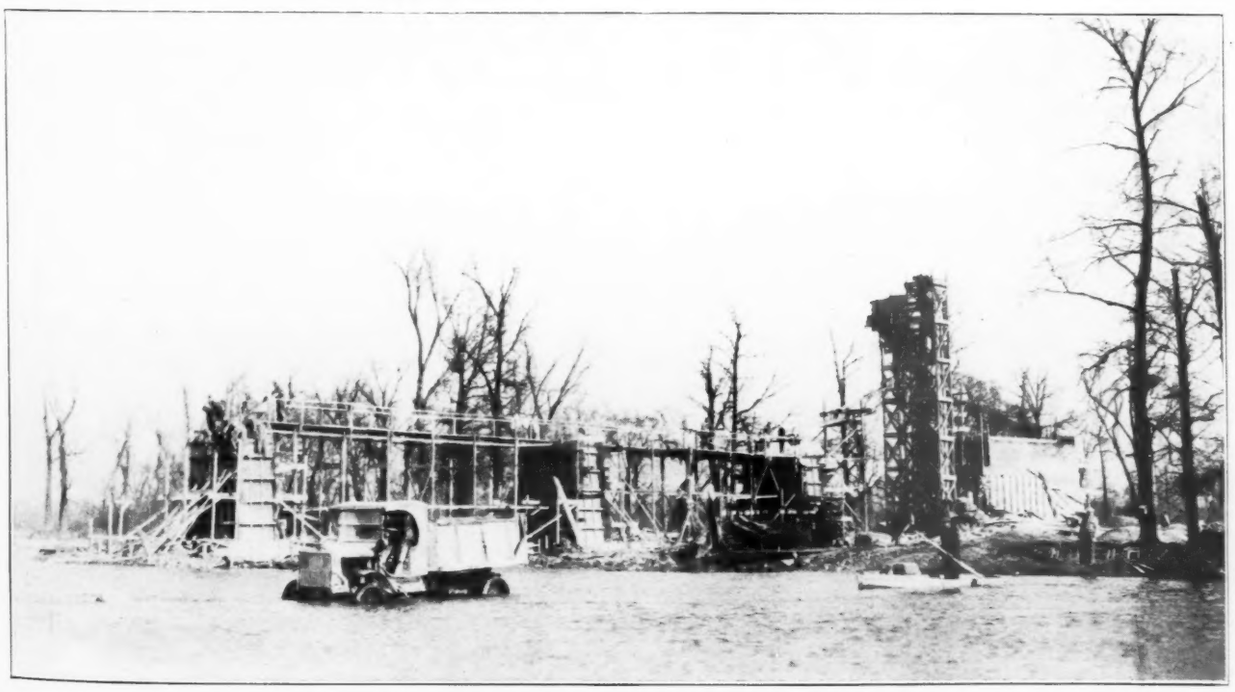
By W. E. Trauffer

THE new sand and gravel plant of Paul Ales, Incorporated, a division of the Material Service Corporation of Chicago, which is under construction on the Chicago Drainage Canal, near Lockport, Ill., will incorporate a number of features which together with the fact that it is to be the largest single sand and gravel operation in the state of Illinois makes it of unusual interest. The material will be hauled from the pit through a tunnel, over a long fill and two bridges to the plant, a distance of more than two-thirds of a mile. The plant itself is to be of the most modern design and will have a capacity of about 5,000 yards a day. A self-unloading boat of special design will haul the material to two docks of the Material Service Corporation in Chicago for distribution, one of these docks being on the North and the other on the South side. These docks are to be of such a design that no rehandling of the material will be necessary. The loading capacity at the plant into the boat will be 1,000 yards per hour. The boat has a low clearance which will allow it to operate on any part of the Chicago river without necessitating the raising of bridges. With this new program in operation it is expected that material can be excavated, loaded, hauled and unloaded at the docks in Chicago at a cost lower than the present railroad freight charges alone.

One End of Conveyor Tunnel at New Plant

The general design of the entire operation is the work of the Maritime Engineering Corporation of Chicago, of which Major Rufus Putnam, formerly United States District Engineer in charge of river and harbor improvement in the Chicago District, is president and Leathem D. Smith, vice-president. Paul Ales, president of Paul Ales, Incorporated, was also identified with the design of the operation at Lockport. E. J. Kozlik, an engineer for the Maritime Engineering Corporation, designed all of the concrete work at the plant and with Mr. Ales is in charge of construction. The Stephens-Adamson Company of Aurora designed the plant buildings and equipment layout.

The property containing the deposit is on the west side of State Highway No. 4, between Chicago and Joliet, at its intersection with the Lock-



Bridge Across Desplaines River Under Construction

Dragline Loading Cars at Test Plant

port road. The gravel is of good quality, running about 75 per cent gravel and 25 per cent sand with a minimum of large stone. The gravel extends to a depth of about 35 feet and beneath it is a deposit of limestone of good quality which might be marketed later on. The overburden is comparatively light, averaging about 4 feet in depth and was removed by a one-yard Northwest gasoline dragline using a three-quarter-yard bucket. About 15,000 yards of the overburden was loaded into trucks and used as fill for the railway embankment leading to the new plant. The remainder was piled off to the side and will also be used for fill as the work progresses.

An unusual feature was the building of an up-to-date plant to be used as a test plant to ascertain the quality of the deposit before beginning the construction of the main plant. This plant has now been in operation for more than a year and the product has gained great favor in that vicinity where it has been used largely for concrete and road work. This plant has produced 1,800 tons

Excavating for Tunnel Under Highway

General View of Test Plant with Sand Hopper at Right

of sand and gravel in a fourteen-hour day and has an average output of sixty yards per hour. The plant was designed by the Smith Engineering Works and is under the direct supervision of Paul Ales.

The pit has been excavated in a straight line from the west edge of the property to the point where the tunnel under the roadway is being built. The same Northwest dragline used for stripping is doing the excavating and to such a width that when the new plant is in operation shovels can begin work immediately in the pit.

The dragline loads into a Western dump car with two eight-yard bodies which is pulled by a Plymouth twelve-ton gasoline locomotive. A standard gauge track about 2,000 feet long is used, running along the south side of the pit and tunnel excavation to the test plant hopper. Both the locomotive and dragline have glass-enclosed cabs for cold weather operation. The dragline also loads directly into trucks whenever pit run gravel is needed.

The test plant is located across the highway from the pit and is on ground about forty feet lower than the original surface of the pit. The track runs across the highway detour onto a short fill and the cars are dumped by hand directly into the hopper of the test plant. The hopper has a rail grizzly spaced 12 inches and is fed by a 24-inch Smith plate feeder into a chute which dis-

Partition Walls for New Plant Under Construction

charges into a 42-inch by 12-foot Telsmith revolving scalping screen. The first two 4-foot sections of this screen have 2-inch and the last has 4-inch perforations. The oversize goes to a No. 5 Austin crusher and the 4-inch to a No. 3 Austin crusher, both discharging into a Telsmith No. 5 bucket elevator, which feeds to a plate screen. The throughs from this screen are conveyed to a road gravel bin while the remainder is returned to the scalping screen. The 2-inch and under from the scalping screen falls onto the 20-inch main conveyor to the washing and screening plant. This conveyor operates on 85-foot centers and is also of Smith manufacture. It discharges into a 4 by 22 foot Telsmith revolving screen, which has an 8-foot scrubber section, 8 feet with ½-inch perforations, and 6 feet with 1¼-inch perforations. The ½-inch section has an outer jacket 5 feet in diameter having ¼-inch perforations.

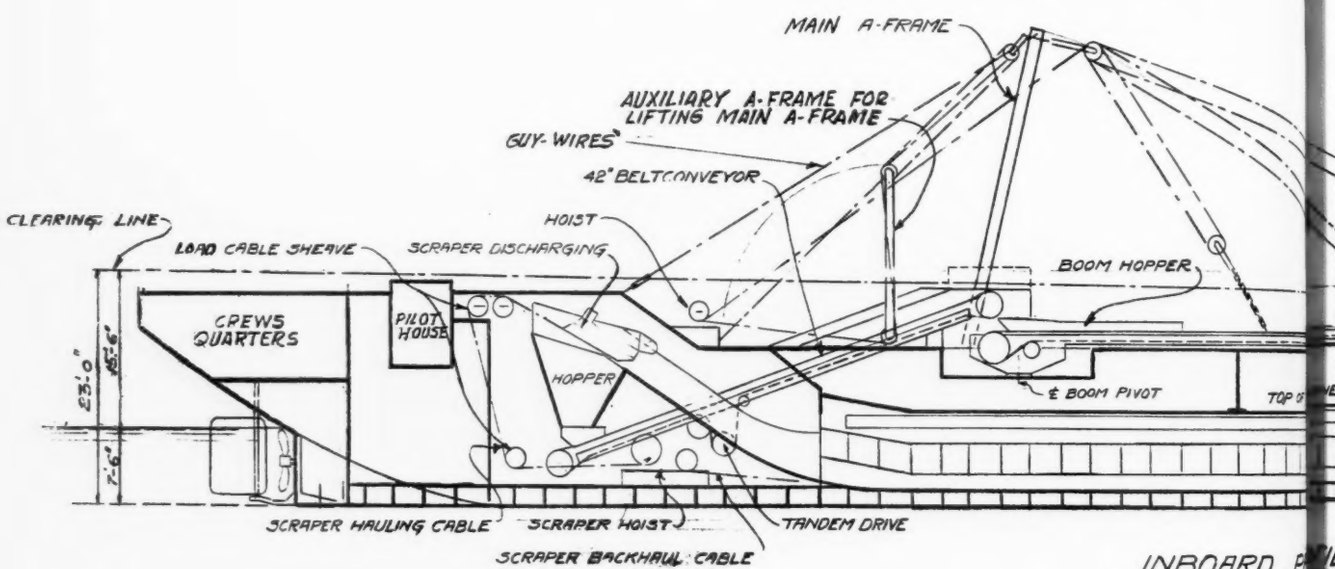
The sand and water are flumed to a Smith settling tank which overflows into a wooden settling tank. Sand from both of these tanks goes to two

SELF-UNLOADING MOTORSH

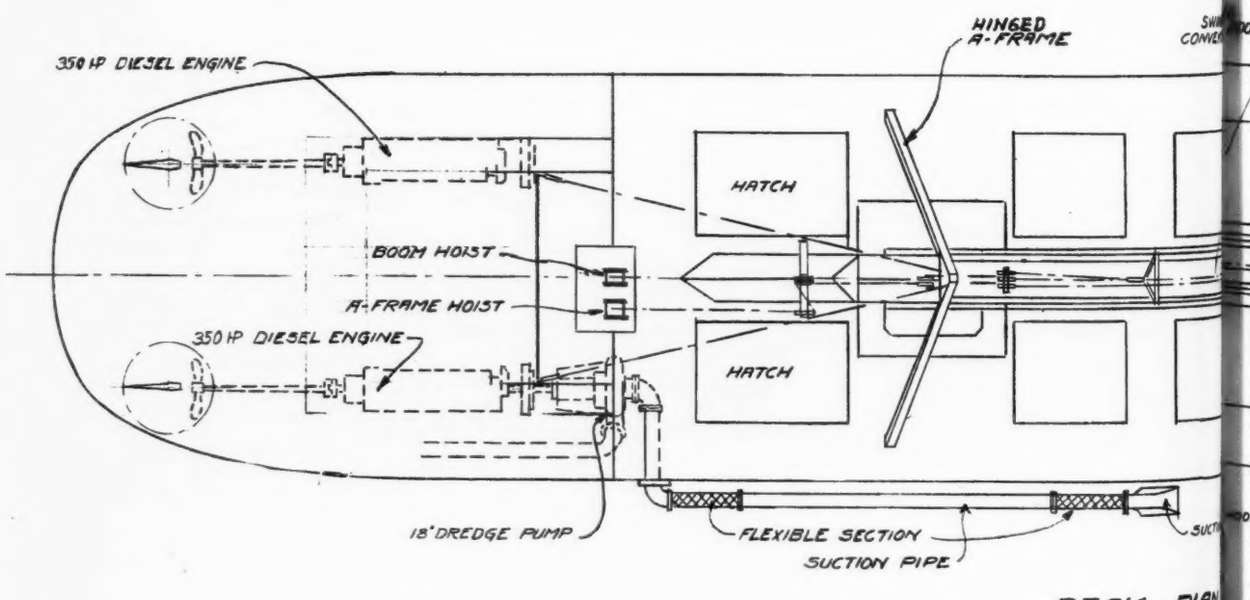
DIMENSIONS &

DESIGNED & BUILT BY: LEAT

205 W WACKER DRIVE



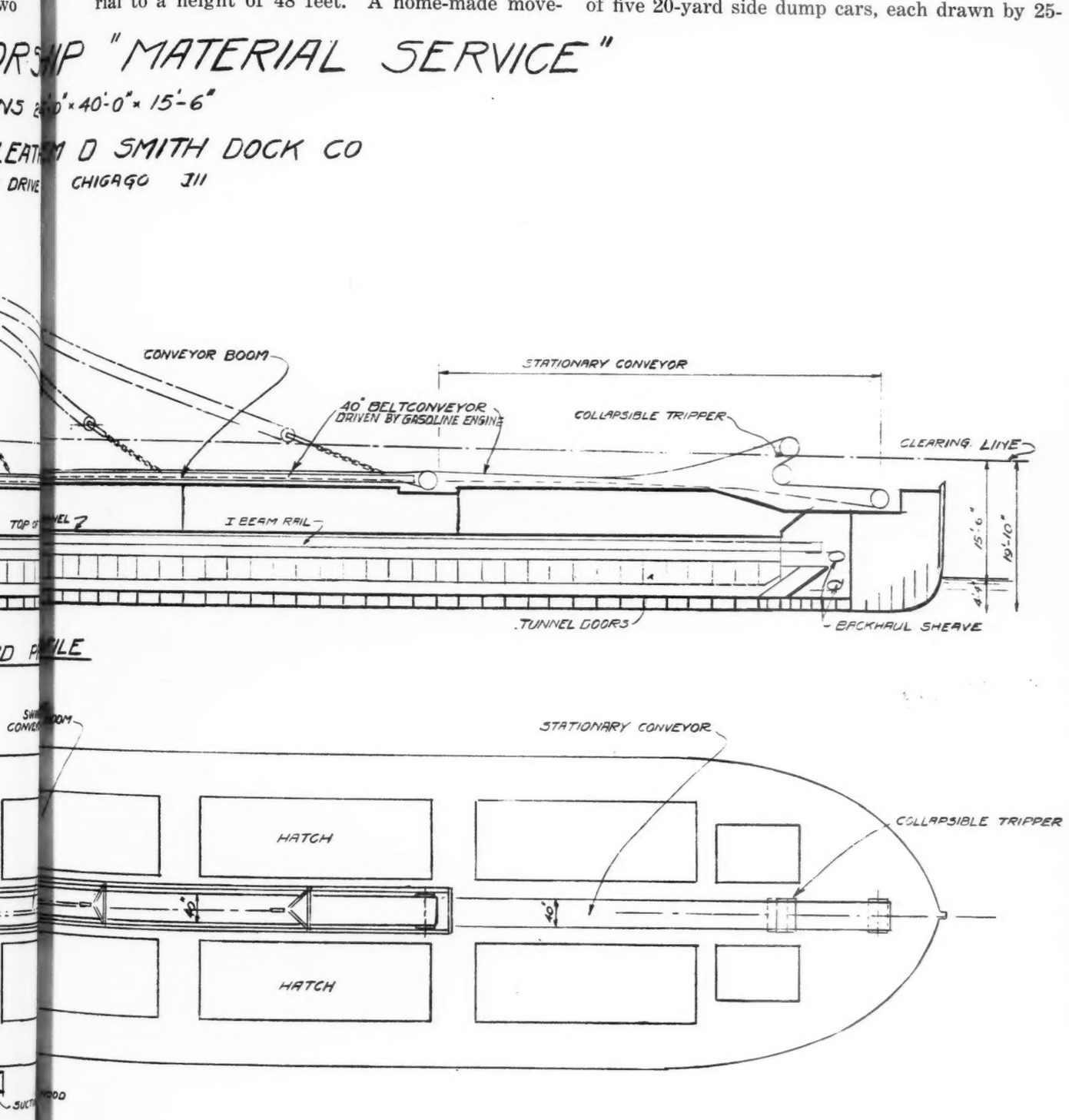
INBOARD P



DECK PLAN

Stephens-Adamson dewatering screws. These discharge onto a Robins conveyor leading to the stockpile. A bypass at the top of the slope allows loading into a Calumet circular steel bin equipped with a batch hopper. The various sizes of gravel go direct to bins under the screen. An arrangement of chutes on the sides of these bins permit loading onto a Robins stock pile conveyor of either sized material or of whatever mixtures are desired. This conveyor is 300 feet long and elevates the material to a height of 48 feet. A home-made moveable tripper allows loading into a Calumet steel bin with a batch hopper or to any one of the stock piles. General Electric and Allis Chalmers motors are used throughout the plant. Washing water is pumped from the Desplaines river through an 8-inch pipe line 1,100 feet long by an Economy 6-inch single stage centrifugal pump driven by a 40 h.p. motor.

When the new plant is in operation a 2½-yard electrical shovel in the pit will load into two trains of five 20-yard side dump cars, each drawn by 25-



Dumping into Hopper at Test Plant

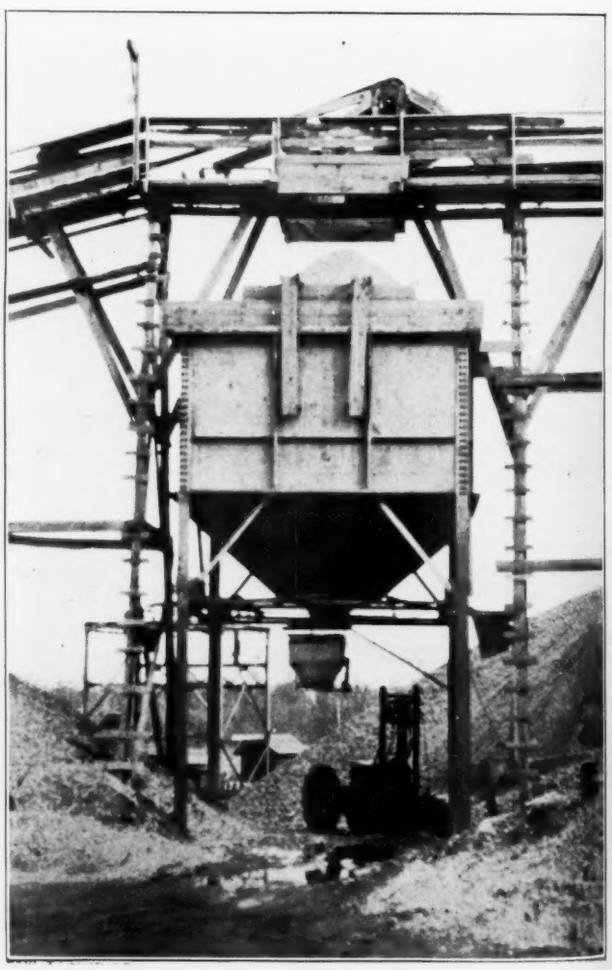
ton gasoline locomotives. These will haul the material through the tunnel under the highway, which is now under construction, to the plant. An Osgood 1¼-yard dragline equipped with a 1-yard bucket is excavating for this tunnel and the material is being hauled away by truck to the fill. Two branches of the Desplaines river between the pit and plant are to be spanned by bridges, one 250 and the other 50 feet long. The concrete piers and abutments are already in place and the steel trusses will soon be installed.

The cars will unload into a hopper of 100 cubic yard capacity in the primary crusher house at some distance from the main plant. A 48-inch plate feeder will discharge over a 5-inch bar grizzly into a McCully 20-inch crusher set at 3½ inches. The pit for this crusher was cut 24 feet deep into solid rock. The material passing through the grizzly and out of the crusher will then go to a 42-inch belt conveyor on 205-foot centers, the tail pulley of which will be 45 feet below grade. This conveyor is to carry the material to the secondary crusher house, where it will be discharged into four roll grizzlies set at two inches. The oversize will go to a four-foot Symons cone crusher and then onto a 36-inch belt conveyor on 65-foot centers discharging into an elevator which returns the material to the roll grizzlies. The throughs will feed onto a 36-inch belt conveyor on 253-foot centers and be carried to the top of the washing and screening plant. The head pulley of this conveyor will be 85 feet above grade.

The building, which will be of structural steel, is to be built on three 6-foot steel girders 75 feet long supported on two of four concrete partition walls, each 25 feet high, over a concrete tunnel running under these walls at right angles to the dock. These partitions will form four separate stockpiles for different sizes of materials and will feed through gates in the roof of the tunnel onto a conveyor to the dock. The tunnel and partition walls and the dock have already been built.

The conveyor from the secondary crusher will discharge into four 84-inch Gilbert conical screens with 1¼-inch square perforations, each of these screens being equipped with a Columbia scrubber. The oversize from these screens will be chuted direct to the third stockpile from the dock. The throughs will go to another row of four Gilbert conical screens with 7-16-inch square perforations. The oversize will be chuted to a 24-inch belt conveyor on 83-foot centers, which discharges onto the fourth and last stock pile. The throughs will go to another row of four Gilbert screens similar to the above except that they have 7-32-inch square perforations. The oversize is chuted direct to the second stockpile and the throughs go to four 20-inch by 16-foot Stephens-Adamson dewatering screws. These screws are to discharge into the first stockpile from the dock.

All of these stockpiles are to be on top of the tunnel, which is 7 feet 6 inches high, 9 feet wide and 240 feet long. Gates in the roof of the tunnel will discharge onto a 42-inch belt conveyor on 285-foot centers, which will feed a 48-inch shuttle conveyor 40 feet long. The shuttle conveyor will be so arranged that it will allow loading either into trucks or into boats at the rate of 1,000 tons per hour. Provision will be made to rinse the material before it reaches the shuttle conveyor. Three 8-



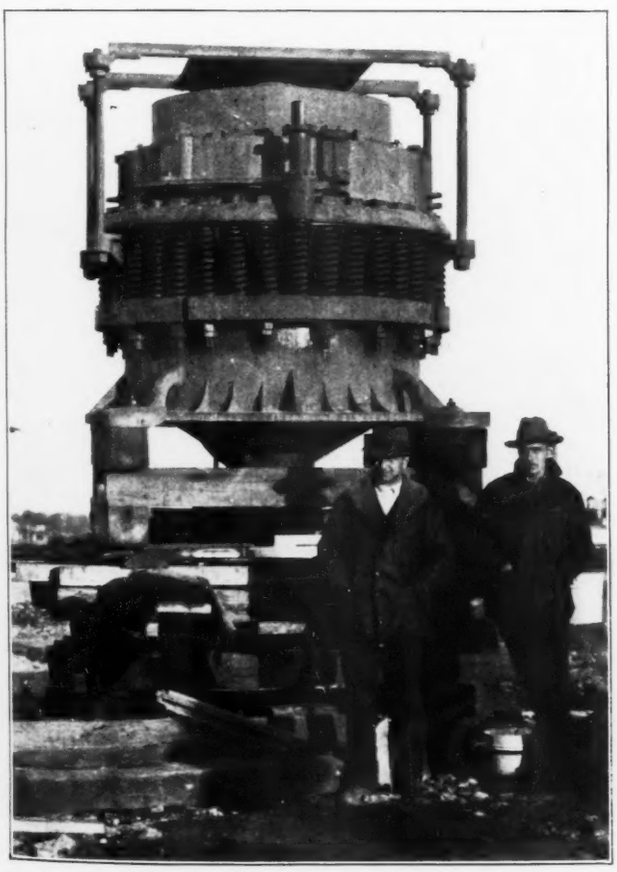
Batch Hopper at Test Plant

inch centrifugal pumps, each driven by 125-h.p. motors and delivering 2,000 g.p.m. each against a 200-foot head, will furnish washing water. Two of these pumps will be in regular use when the plant is in operation and the third kept in reserve and also used for rinsing water when the tunnel is in operation.

The boat, "Material Service," which is to carry the material to the Chicago yards, was designed and built by the Leathem D. Smith Dock Company of Sturgeon Bay, Wis., and will carry 2,500 tons on a 12-foot draft. It is 246 feet long with a 40-foot beam and is designed to operate under bridge clearances of 15 feet 6 inches. Two 350-h.p. Winton full diesel engines operating twin screws will give a loaded speed of 10 m.p.h. The unloading apparatus is very similar to that of other Leathem D. Smith designed self-unloading boats. Two 4-yard crescent scrapers feed to a 42-inch inclined conveyor 50-foot centers which delivers to a 40-inch boom conveyor 90-foot centers on a swinging boom. The A frame supporting the boom lays down on the deck when low clearance is required. Lifting of the A frame and boom conveyor is done by a double drum worm gear hoist. The unloading machinery is driven through bevel gears and shafting from the forward end of one of the diesel engines.

The boat is also equipped with a 15-inch sand dredging pump driven from the forward end of one of the diesel engines. Plans are to use the boat as a sand dredge in Lake Michigan when not required at Lockport. The sand will be pumped into sand boxes which will deliver the sand to the unloading conveyor which is equipped with a collapsible tripper to discharge into the various hatches. One trip per day is expected to be made between Lockport and Chicago. When demand exceeds the capacity of the boat additional material will be transported by tugs and barges.

Elevator and Revolving Screen at Test Plant



Paul Ales, Left, and E. J. Kozlik, Right, with Secondary Crusher for New Plant

The boat will deliver the material to two docks in Chicago owned by the Material Service Corporation. One of these has been in operation for a year, handling material from other sources and is on the north branch of the Chicago river at Halsted street. Unloading here will be direct to stockpiles on shore. A 25-ton Ohio and a 30-ton McMyler locomotive crane rehandle the material into trucks direct and into bins. Plans are now being prepared by the Maritime Engineering Corporation to improve this dock in somewhat the same manner as the one described below.

The 7-acre site for the other dock, which is at Ninety-second and Ewing streets, was purchased recently. A concrete tunnel is now under construction 70 feet from the river bank and parallel to it. Concrete partition walls will divide up the space over the tunnel so that the different grades of material can be unloaded separately into them from the boat. Trucks will run into this tunnel and load directly from gates in the roof of the tunnel. The Maritime Engineering Corporation also designed this dock.

Other plants owned and operated by the Material Service Corporation are the Peoples Crushed

(Continued on page 62)

RECORDS THAT WATCH THE WORK OF SALESMEN

THE relations of a sales manager to his men are essentially personal. When the work of a sales department is directly dependent on a number of men whose personalities necessarily cover a wide range of types, strict organization is even more systematic. Hence the need of a system that keeps a daily, detailed sales record flowing into the sales manager's office to be recapitulated and condensed into monthly and annual reports. These reports serve not only as a basis for the comparison of current with past results, but also for looking ahead—for sensing every little trend that might indicate the chance for an unusual increase in sales, or for avoiding a possible slump as compared to the corresponding periods of previous years.

The method of tabulating records of individual salesmen as described in this article has worked out successfully for a concern whose sales organizations include a number of branch sales offices located in various parts of the country. Each of these offices take care of territory which average about the size of a state. Furthermore, in large cities the firm maintains a resident salesman on salary.

These salaried salesmen have the stimulus of a prospective salary increase at the end of each year. They are directly responsible to their respective branch sales managers. At the end of each day each salesman reports his sales to the branch office. The work of all salesmen in that territory is assembled and forwarded to the general manager on that day. Thus, a sales report similar to Figure 1 is sent to the head office each evening.

Each order is first checked to make sure that the prices, cost, credit delivery promise and other details are correct. Then this daily report is analyzed and recorded both according to the salesmen and the items. Recapitulations of these daily reports are made up at the end of each month and are checked against the monthly sales report submitted by each branch manager, who keeps a detailed record of each salesman's work.

The monthly sales reports from each branch office are kept on cards such as Figure 2. On the backs of these cards are shown the total annual comparisons, as in Figure 3.

Although the head sales office knows exactly what each individual salesman has done, the responsibility for his work is directly on the shoulders of the branch managers who know all their salesmen personally. They know how to help each man, how to make the individual application of sales policies established at the head office, and often how to qualify general rules to make them meet most effectively varying conditions. In turn, the general manager knows all his branch managers. His personal touch with them better enables him to help them solve their problems. They are directly responsible to him alone.

Such a simple organization has a greater number of advantages than are apparent to the executive who does not use the branch sales office idea. The mere fact that a star salesman has the chance of getting one of the branch office jobs is a real incentive to him.

In case a sales organization aims to cover a large

ORDERS RECEIVED 192–

Name	Territory	Salesman	Goods	Amount Sales	Net Proceeds	Cash	Cost	Remarks

Figure 1—Daily Sales Report Sent from Each Branch Office to the Main Office

Sales of					Year		
Month	Article A	Article B	Article C	Sundry	Total Sales	Expense	Profit
Jan.							
Feb.							
Mar.							
Apr.							
May							
June							
Dec.							
Total							

Figure 2—Monthly Sales Reports from Each Branch Office

territory or the whole country, it is impossible for one man, or a number of men for that matter, in one place to keep in effective touch with all the salesmen, providing the business employs enough salesmen to work the country intensively. When such a number of salesmen are directly managed from the head office, often a multitude of salesmen flock to headquarters periodically, where perhaps a series of "ginger meetings" are held. But it is comparatively difficult to inject into a great number of salesmen at one time sufficient general "ginger" or "pep" to last them through a season. Such a system, furthermore, keeps a salesman away from home a great percentage of time, an objection that is met by the plan of having a resident salesman in different sections of the territory covered.

Another important advantage of the branch

YEARLY COMPARISON						
YEAR	Article A	Article B	Article C	Sundry	Expense	Profit
1925						
1926						
1927						
1928						

Figure 3—Total Annual Comparisons

office sales system is the help it gives in planning a sales campaign. In addition to scheduling general sales policies and plans for the year, they may be augmented or modified so that they will yield good results in each of the different branch office territories. In this way actual present conditions as revealed by the sales records may be taken into account in planning sales for the coming period. Resident salesmen and branch office managers can sense prospective changes that may alter sales conditions in their respective territories much better than the non-resident man who does not have a "home" interest in the territory he works.

Usually, to anticipate and prepare for changes before they take place requires real sales generalship. But this kind of systematic record keeping makes such foresight comparatively easy. Combine the resident salesman and the branch sales office plan with a thoroughly analyzed record of sales at the head office and fairly accurate forecasting of trade tendencies may be had.

However, it must be understood that it is not good generalship to depend entirely on subordinates for information about changing conditions. When sales records are properly analyzed, they mechanically suggest not only increases or decreases of sales in comparison with previous business, but they also indicate the beginning of favorable or unfavorable conditions.

From such records of the current and previous years it is possible, with the help of the branch sales organization, to forecast the demands for the product so closely that any variation may easily be taken care of. With such records as a guide it is possible to estimate in advance the year's requirements.

In general, the sales organization should include a fairly and, so far as possible, a personal supervision of salesmen, and should reveal trade tendencies in advance so that changing demands may be made more than half way.

Toll Roads Opinion

The toll road developed to a high point of efficiency to give service to motorist and operators of commercial bus and truck fleets has an economic standing today and may be one of the important coming developments in application of motor vehicles to modern transportation needs in the United States, according to the conclusions of Piero Puricelli, president of the Societia Anonima Autostrade of Milan, Italy, and honorary vice president of the National Highway Traffic Association, who will submit an interesting report on toll roads at the annual meeting of the association at the Automobile Club of America, New York City, December 10, 11 and 12. Signor Puricelli has headed the construction of a system of express motor toll highways between the principal cities of Italy and in his work has had the support of Premier Mussolini.

The growing trend to operation of vehicular tunnels, bridges, and other facilities for saving time and distance for motorists on the toll basis is leading to demand in some quarters for high speed, express highways in this country, engineers find. The conclusions in his report on "The Economic Status of Toll Roads" follows:

"Toll roads do not conflict either with public or with private rights. In the field of private rights, they represent a contract relation on the type of the transport contract between owner of the road and the user. In the field of public rights, they are subsidiary to the network of the ordinary highways and therefore subject to the control and coordination of the state. The creation of such roads must be called for by special conditions of locality and traffic, and placed in relation to the already existing network of highways, which must be developed to the highest degree by the public authorities. The amount of the tolls must be in direct relation to the advantages which the actual user of the road derives from the same."

Would Standardize Truck Wheel Angles

Suggestions have been made by several truck manufacturing companies that the question of standardizing the inclination of steering knuckle pivot pins be taken up by the standards committee of the Society of Automotive Engineers. The desirability or otherwise of taking up this project is now before the members of the motor truck division of the standards committee. It is pointed out that the angle of the pivot pin controls the camber and the caster of the front wheels and affects the toe-in, which in turn determines to a considerable extent the wear of the tire tread. Considerable experimental work has been done by tire and vehicle makers to ascertain the best degrees of caster, camber and toe-in of the wheels and the first move toward standardizing these would be to gather and analyze all such data.

(Continued from page 59)

Stone Company, at La Grange, which has a capacity of 1,500 yards per day, and the Gibbons & Griffin sand and gravel plant, at Carpenterville, with a 2,500-yard daily capacity. These plants at present supply material to ten yards in Chicago, also owned by this company, including the two dock yards mentioned above. Officers of the Material Service Corporation are: Henry Crown, president and general manager; Irving Crown, treasurer, and John Gutknecht, secretary.

GASOLINE ENGINES IN THE PIT AND QUARRY

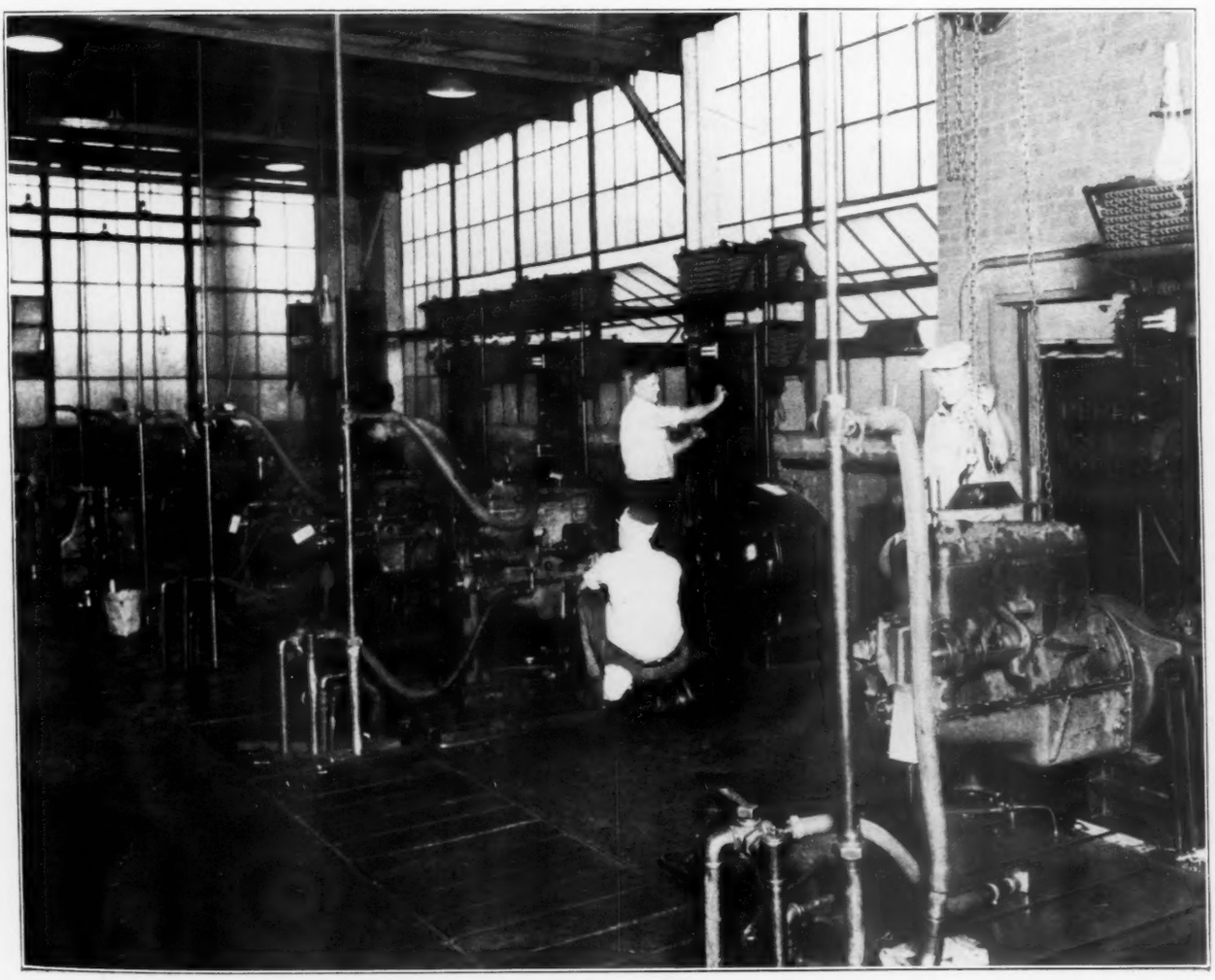
By H. W. Munday

GASOLINE engines are a particularly important unit in the Pit and Quarry Industries as they are in service in practically every individual plant in these industries either as a power unit for some independent self-contained machine, such as shovels, cranes, locomotives, compressors, drills, etc. or as a separate power unit for driving crushers, screens, dredges, pumps, etc. or as a standby power plant for emergency use.

All gasoline engines belong to the group known as internal combustion engines but differ from a gas engine in having an atomizer attached for spraying a fine jet of the fuel into the air admission pipe. Gasoline engines are built in one, two, four, six and eight cylinders. Standard designs run up to 40 brake horsepower. The four and six cylinder units are more generally of interest to the Pit and Quarry Industries with the four cylinder unit more in use. The range in velocities is from 800 to 1750 revolutions per minute. The cost ranges from $20.00 to $35.00 per horsepower. The weight of the complete unit ranges from 10 to 27 pounds per horsepower. In both cost and weight per horsepower, gasoline engines are less than oil or Diesel engines which also classify as internal combustion engines.

Gasoline engines are constant volume units. The combustible charge is compressed and then exploded at the inner dead center position of the piston and results in practically constant volume combustion. The cycle is completed by the expansion stroke following, the burned gases being discharged after the opening of the exhaust valve, largely at constant volume.

In four stroke cycle engines, the charging and discharging actions are carried on by the engine cylinder itself with the latter acting as a pump for two strokes. The first stroke is the suction, the second stroke is the compression, the third stroke is the expansion and the fourth stroke is the exhaust. In two stroke cycle engines the suction and exhaust strokes are eliminated. The cylinder is

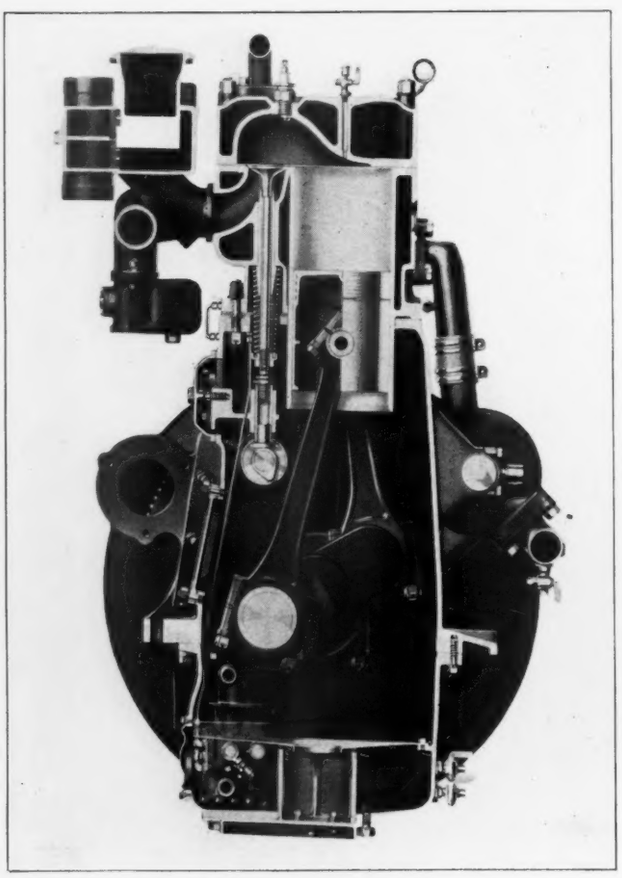


View in the Hercules Testing Room

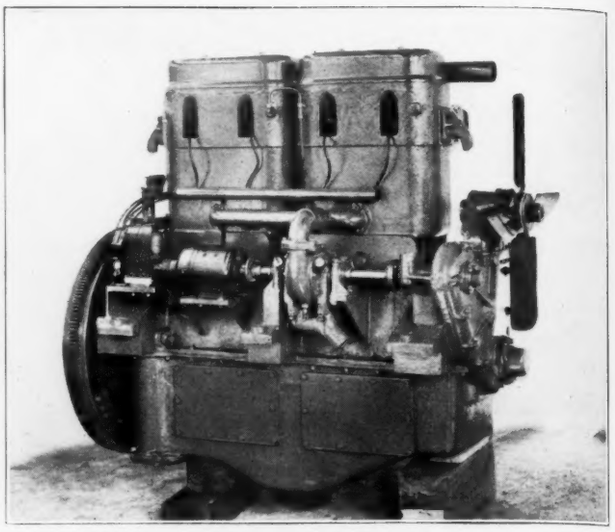
charged with fresh fuel and cleared of burned gases by other than the action of the power piston of the engine. The power cycle is completed in two strokes.

The cylinder arrangement varies and may be grouped as tandem, double, two cylinder, three cylinder, double tandem, and opposed arrangement. In the tandem arrangement all the cylinders are in line acting on the same crank and not more than two cylinders are usually employed and then may be either single or double acting. In double, two cylinder, three cylinder, etc. engines, the cylinders are placed side by side usually acting on as many cranks as there are cylinders and they may be single or double acting. In double tandem arrangement usually four cylinders are found, two each in tandem, acting on two cranks, and may be single or double acting. In the opposed arrangement, two or four cylinders are opposed to each other and when four are used they are in pairs. Any two opposed cylinders may act on the same crank or each cylinder may have its own crank. Practically all vertical gasoline engines are of the four stroke cycle types although vertical two stroke cycle gas engines have been built.

The efficiency of an industrial gasoline engine can be tested in a simple manner by simply counting the number of explosions when pulling full load and when pulling no load. To determine the mechanical efficiency, subtract the number of explosions per minute when pulling no load from the number of explosions when pulling full load and divide by the number of explosions when pulling full load. This method is simple and yet is scientific.



End Cross Section of "W" Series of Waukesha Engine



A LeRoi Gasoline Engine

When you count the number of explosions made per minute by your gasoline engine when it is not pulling any load, you will realize that every explosion means just so much gasoline wasted. In some engines, a certain weight of gasoline is sucked into the cylinder every time and it is that amount multiplied by the number of explosions per minute that is absolutely lost per minute when the engine is running empty. If your engine explodes 30 times per minute when running empty, 30 charges of gasoline are lost. If it explodes 120 times when pulling full load, there will be 30 explosions wasted every minute in running the engine itself. This loss is due to internal friction. This internal friction is a fairly constant quantity regardless of load. In the example cited, there will be (120-30=90) 90 divided by 120 or 75 per cent.

The formula for mechanical efficiency can be expressed as follows:

$$\text{Mechanical Efficiency} = \frac{EF - EE}{EF}$$

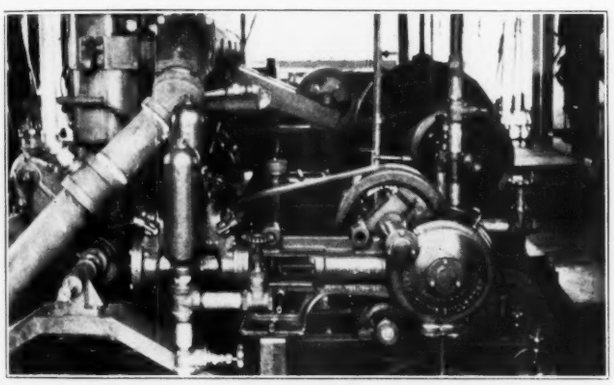
Where EF is the number of explosions per minute when pulling full load.

Where EE is the number of explosions per minute when pulling no load.

The formula clearly shows that the mechanical efficiency can be improved by reducing the number of explosions when pulling no load. The example cited was for an efficiency of 75 per cent. This is a low efficiency and should in reality be about 90 per cent. It is seldom that the efficiency can be maintained above 90 per cent over any length of service. This is due largely to the lubrication problem. The proper lubricant, the lubrication system and the correct amount of lubricant have everything to do with the mechanical efficiency of a gasoline engine.

When the mechanical efficiency of the engine is improved, the power of the engine is increased. In the example cited, the number of explosions per minute under no load would be reduced to 12. This is the difference between 120 and 90 per cent of 120. The number of useful explosions would then have been increased from 90 to 108 or 18 explosions. This is 20 per cent of 90 which means the power of the engine has been increased 20 per cent. If the engine discussed was a 50 h. p. unit before the test and the necessary improvements were made to increase the efficiency to 90 per cent, the power would be increased (50 x 0.20=10) 10 h. p. The engine would in fact become a 60 h. p. unit and not any more gasoline would be used in developing this power.

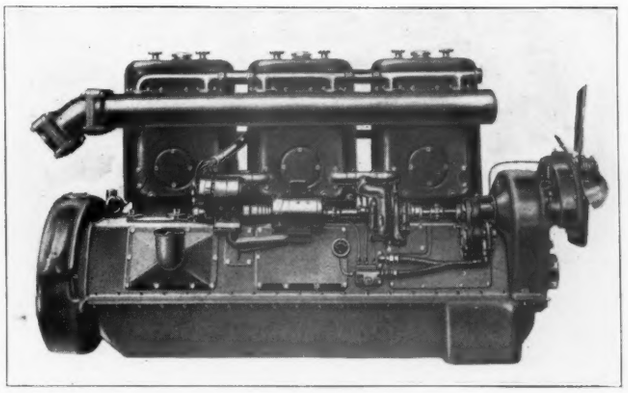
It is good economy to count the explosions per minute of your gasoline engine every once in a while and to put the engine back into efficient running condition. Close attention should be given to lubrication. Watch the piston rings also and see that they are as leakproof as possible. The piston rings must fit the piston and the cylinder. Keep



An Interior of a Dredge Driven by Gasoline Engine

the cylinder in a good smooth condition never permitting it to score. Keep the bearings properly aligned and lubricated at all times. If these points are watched, the number of explosions per minute while pulling no load will be reduced materially and the mechanical efficiency improved accordingly.

Lubrication is an important factor in the efficiency of a gasoline engine. Regular, ample and correct lubrication are necessary. Each gasoline engine has some particular lubrication system and it should be carefully studied and considered before the gasoline engine is actually purchased. After the unit has been purchased, the operator must see that an oil of suitable grade and quality is used, that it is maintained at the proper level and drained and replenished at the proper intervals. All other features of the lubrication system of most gasoline engines is automatic and usually effective. The cylinders and pistons are subjected to the most severe service—they are exposed to the highest temperatures of the burning fuel and are the largest rubbing surfaces in the engine. The

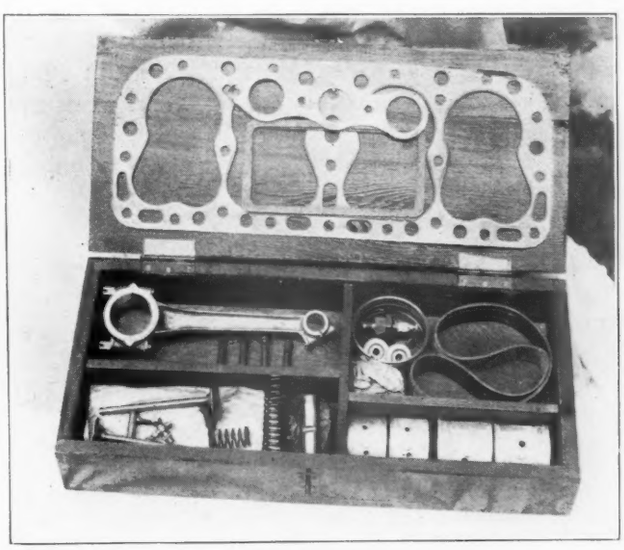


A Stearns Engine

manner in which the cylinders and pistons are lubricated should be carefully examined. Some lubrication systems are more effective than others, but the individual purchaser must make his own choice. Nothing will be said here of the relative methods of the different systems except that positive pressure lubrication has proven its efficiency and the operator of the gasoline engine must tend to the lubrication problem after he has put the unit into operation.

There are a number of concerns manufacturing gasoline engines which are used in the Pit and Quarry Field. Among such concerns are the Climax Engineering Company, Continental Motors Corporation, Buda Company, Hercules Motors Corporation, Le Roi Company, Novo Engine Company, New Way Motor Company, Stearns Motor Manufacturing Company, Waukesha Motors Company, Wisconsin Motor Manufacturing Company. Some of the gasoline engines manufactured will be discussed briefly. It may be well to note here that detailed descriptions of some new gasoline engines will be found in the December 19th issue of Pit and Quarry and such detail will not be attempted here.

The Wisconsin Motor Manufacturing Company



A Waukesha Service Kit Containing Most of the Necessary Parts for Emergency Field Repairs

manufactures three sizes of industrial power units: Model SU, 4x5, four cylinder; Model W, 4⅛x5, four cylinder, and the Model X, 4½x5, four cylinder. All three engines are almost identical in design, being of the valve-in-head type with full force feed oiling system through drilled crankshaft, three-point suspension, removable cylinder head, cooling by means of centrifugal water pump. Cylinder and crank-case castings are of the finest close grained grey iron; all main bearings, bronze backed babbitt lined; crankshaft of 40% carbon steel, machined and balanced; connecting rods 35% carbon steel forgings, heat treated; valve tappets 20% carbon steel, carbonized and hardened; valves of special chrome silicon steel; timing gears, crankshaft and drive gear of 20% carbon steel; camshaft and idler gear semi-steel.

The oiling system is of the full force-feed type, through drilled crankshaft to all main and rod bearings. A direct oil lead is taken to the hollow rocker lever shaft which gives direct lubrication to each individual rocker lever. This insures quiet operation and long life for the rocker levers.

A feature of Wisconsin design is the easy accessibility to all working parts and accessories. For example, the valve tappets are assembled on plates bolted to cylinder block. These plates may be removed and any adjustments made without disturbing other parts of the engine. The same accessibility applies to other units, such as magneto, carburetor, governor, etc.

The combination inlet and exhaust manifold is bolted to the side of the cylinder head. This manifold is so designed that enough heat from the exhaust is passed by the inlet passage to thoroughly vaporize the incoming fuel. This construction, together with the overhead valve system and Wisconsin design of camshaft, produces an unusually efficient, and at the same time, a very economical operating engine.

An oil gauge of the bayonet type is provided on the side of the motor with a mark indicating the correct high level of oil. An oil pressure relief valve is also provided to guard against excessive oil pressure. For the Types SU and W engines, the pressure runs about 20 pounds with the engine operating at 1,000 revolutions. On the Type X about 30 pounds at the same speed.

All power units include as standard equipment—engine, with Bosch magneto with impulse coupling. Stromberg carburetor, air cleaner, governor, fan and fan belt, starting crank, spark plugs, wiring and cable holder, house radiator, gasoline tank, muffler, panel with control levers, and plain flywheel. Units are also furnished with clutch and power take-off shaft, running at engine speed supported on heavy ball bearings, or clutch and 4 to 1 ball bearing reduction gear, with power take-off shaft.

A Part of the Waukesha Test Floor

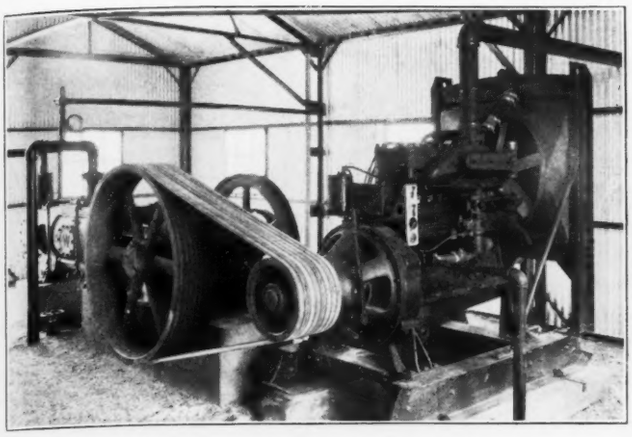
The Climax Engineering Company has recently developed a new four cylinder valve-in-head gasoline engine called the Blue Streak. It is a 6 by 7 unit and develops better than 110 h. p. at 1200 r. p. m. on block tests. The range of power developed is shown in the following table.

R. P. M.	H. P.	Pounds of Fuel per H. P. Hour
500	50	.62
600	62	.61
700	73	.60
800	83	.58
900	92	.57
1000	100	.57
1100	106	.575
1200	110	.59

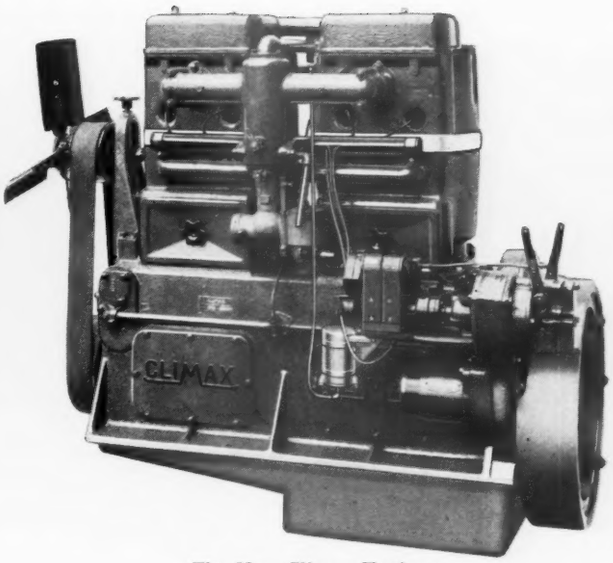
The new design and construction of this engine offer economies in fuel consumption. Tests showed the fuel consumption in comparison with the load to be as follows:

Load	¼	½	¾	Full
Fuel Consumption in pounds at 1000 r. p. m.	1.0	.72	.61	.57

In addition, the new Climax is said to be built on new service-winning standards. It has simple cylinder barrels; large water jackets to prevent the distortion of cylinders; valves have large cooling areas to prevent the warping of valve seats; hold down bolts are so located that gasket troubles are virtually eliminated and a vacuum spark control that works automatically.



Texrope Drive Used with Gasoline Engine



The New Climax Engine

The new automatic spark control operates from the suction in the intake manifold. Since the variation in pressure in the intake manifold is proportional to the load on the engine, the ignition is timed correctly no matter how the load varies.

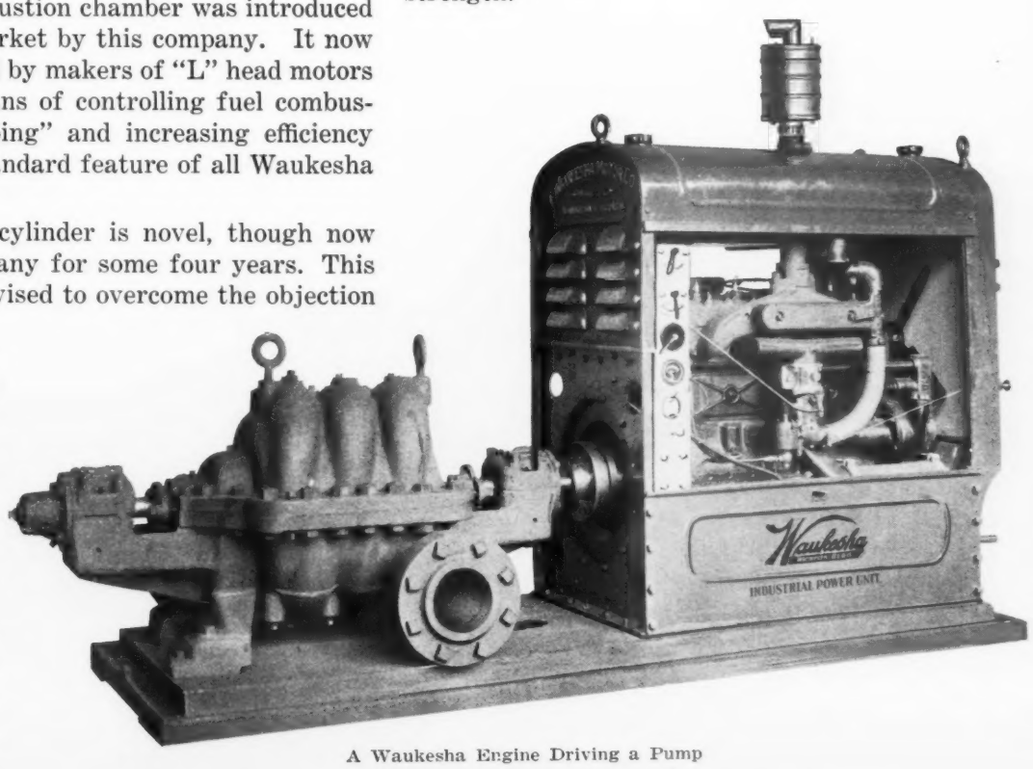
One of the late additions to the Waukesha engines is known as Model J. K. This engine is a four cylinder unit. The bore and stroke are 6½ by 7 giving it a piston displacement of 926 cubic inches. A new six cylinder Waukesha has been developed and will be exhibited at the Road Show in January with possibly two new four cylinder Waukesha units.

The J. K. engine is of special interest as it follows the now familiar lines of this company's oil field engines which are built in cylinders cast in pairs, twin-cast iron crankcases with over size center bearing, full pressure oiling and Waukesha built-in governor are among its features.

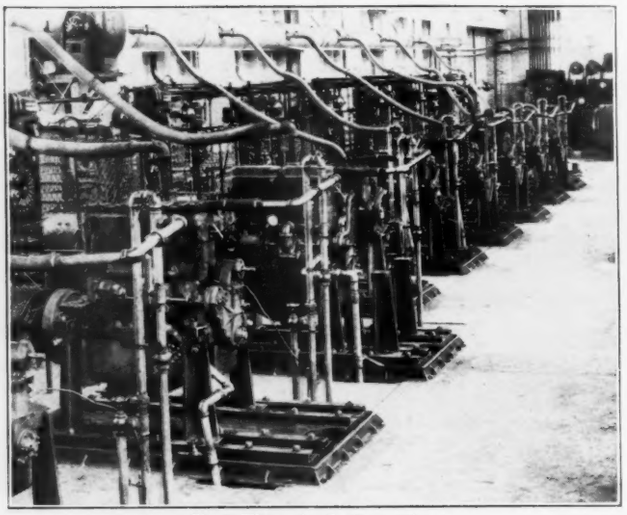
The Ricardo combustion chamber was introduced to the American market by this company. It now is generally accepted by makers of "L" head motors as the simplest means of controlling fuel combustion, eliminating "ping" and increasing efficiency and life, and is a standard feature of all Waukesha engines.

The "truncated" cylinder is novel, though now in use by this company for some four years. This construction was devised to overcome the objection to single castings that combine in one piece cylinders and crankcase, and yet secure the rigidity and fixed alignment of parts that the unit casting affords. It is accomplished by placing the flange for bolting the cylinders to the crankcase at a point that corresponds with the top of the piston when it is at the bottom of its stroke. The crankcase is thus brought up some six inches higher than on conventional designs. This added depth of crankcase vastly increases its stiffness, and is said to make for more close alignment of bearings and moving parts than a single unit casting, as it is a simple design with exceptionally uniform sections and therefore not subject to the distortion of the casting strains generally found in more complex pieces. With this construction a freeze-up becomes a minor accident, as only the cylinders need be removed for repairing.

With the resulting increased depth of crankcase it is also possible to provide adequate inspection openings for valves and bearings without loss of strength.



A Waukesha Engine Driving a Pump



Test Floor in LeRoy Plant

Other features include large four-bolt connecting rods with replaceable bronze backed babbitt bearings, large capacity oil and water pumps, large valves surrounded by a big volume of water, outside adjustment of oil pressure and readily removed oil screen.

The engine is available as a complete power unit including radiator, house and all accessories for portable power for either belt, gear, coupled or chain drive, or independently for installation by manufacturers of power driven equipment.

The new Waukesha "Great Six" engine is built in three sizes—6¾x8½, 7¾x8½—with horsepower ratings ranging from 200 up. Engine mounting has been arranged for a standard base, or for special applications.

While Waukesha engines have always been easily maintained and serviced, none have reached the perfect accessibility to be found in the largest Great Six. On the water pump side of the crankcase are three openings in both the upper and lower half that are large enough to permit the removal of pistons and connecting rods, main bearing caps, and all other vital parts inside the crankcase without disturbing the engine's alignment or removing it from its mounting. On the manifold side large hand holes are also provided that afford accessibility to all the valve gear and valve gear parts for adjustment or renewal.

Cylinders are cast singly and with individual heads carrying the genuine Ricardo combustion chamber. With individual castings it is possible for one man to handle any cylinder replacement that may be necessary. It also reduces the cost of replacement in case of accident. Adjustments of the oiling system, even to the dismounting and cleaning of the oil header, relief valve or pump, can all be made without dismantling of other parts, as all of these units are bolted to the outside of the crankcase.

The oiling system in this engine is one of the most complete found in any engine today, and is designed to function under all conditions of operation and in every tilted position in which the engine may be placed. The oil supply is carried in the large tank directly above the water pump and not in the base. This oil tank serves the double duty of an oil cooler and the reservoir for the ten gallon supply. From this tank, oil flows to the pressure pump by gravity and from there is forced under pressure through a special filter to all of the seven main crankshaft bearings, cam shaft bearings, connecting rod bearings and timing gears while a special header feeds dipper troughs below each connecting rod to provide splash lubrication for the cylinders and pistons from the moment the engine starts. The surplus drains into the base where a double scavenger pump, bolted to the outside at the front of the engine, picks it up and returns it to the cooling reservoir for re-circulation. The relief valve controlling the pressure in the circulating system is adjustable from the outside.

A Typical Hercules Engine

A series type oil filter is provided through which all of the oil from the pressure pump is fed and cleaned before it reaches any of the bearings.

To further insure prompt and adequate lubrication of the pistons and cylinders the duplex oiling system is used. From an outside tank, entirely independent of the circulating system, is forced fresh cool oil in a measured quantity at regular intervals to each individual cylinder and piston.

Extreme care has been used in providing ample and adequate cooling for the Great Six engines. A twin circulating pump has been installed with two separate independent pumping units, one for the forward bank of three cylinders and the other for the rear three. The design of the headers and water manifolds as well as the porting in the cylinders and heads insures a large volume of water around the valves and over the compression chamber as well as a complete water jacketing of the combustion space of the cylinder. Large hand holes afford ample room for the removal of scale and sludge.

Twin carburetors are used to insure an adequate fuel supply for these large engines with proper equalization and distribution. By splitting this duty between two carburetors it is possible to secure sensitive response and smooth control.

Provision has been made for double ignition with two spark plugs in the cylinder. Although

single ignition with the standard Ricardo head is adequate to develop the full efficiency of the engine, for added reliability a second magneto can be installed ready for any emergency.

The Le Roi Company builds four and six cylinder valve-in-head engines ranging from 40 to 170 h. p. Perhaps the most noteworthy features about these engines are the extra large crank shaft, large bearings and liberal proportion of the duralumin connecting rods and full force feed lubrication. The six cylinder engine has a dual ignition usually consisting of the Leese Neville system and the Eisemann magneto. The cylinders are cast in pairs and are interchangeable between the four and six cylinder models. The six cylinder units are built for continuous operation at speeds ranging from 1000 to 1100 r. p. m.

Continental industrial engines and power units are of the heavy duty type. The Red Seal series consists of a power range from 5 to 96 h.p. furnished ready to operate in either two, four or six-cylinder models. All these units are equipped with governor sets to run at the following speeds: two-cylinder engines, 1,250 r.p.m.; four-cylinder engines, 1,200 r.p.m.; six-cylinder engines, 1,600 r.p.m.

Any other speeds may be obtained through reduction gears. Reduction gears growing speeds of 2 to 1, 3 to 1 or 4 to 1 are supplied with or without clutches and running either clockwise or counter clockwise. All Continental "Red Seal" industrial units are force feed lubricating types with ample bearing areas to withstand heavy duty service. A stub shaft is supplied for direct drive purposes, which is bolted direct to the flywheel. A power take-off without clutch for pulley or pinion mounting is supplied. Right angle drives are also available in various reduction ratios for several of the Continental power units.

The Stearns Motor Manufacturing Company manufactures industrial gasoline engines for several industrial machines. The HU unit is 4½ by 6½, 4-cylinder unit is suitable for ½-yard shovels, cranes, draglines, etc., and air compressors up to 200-cubic-yard capacity. The AU unit is a 4¾ by 6½ engine, used for the same equipment, but for larger units. The DU unit is a 5⅛ by 6½ and develops 70 h.p. at 1,000 r.p.m. The E. U. unit is a 5½ by 6½ four-cylinder unit and develops 80 h.p. at 1,000 r.p.m.

The New Way Motor Company manufactures the "New Way" twin air-cooled engine. The air cooling is accomplished by a powerful flywheel fan which forces air uniformly onto the cylinder and cylinder head. The cylinders are en bloc cast iron alloy with detachable cylinder head for accessibility. Alloy steel valves-in-head are operated by enclosed push rods. Crankshaft runs on oversize Bower roller bearings and the cam shaft on Hyatt flexible roller bearings. Positive plunger pump lubrication is used. Only two gears are involved, one on crankshaft and one on the cam shaft.

The Buda Company manufactures heavy duty four and six-cylinder, en bloc, L head industrial gasoline engines in several sizes. The four-cylinder heavy duty units have a force feed lubricating system contained in a seamless tube cast integral with the crankcase. The oil pump is submerged in oil. Large one-piece alloy valves are used with removable valve guides and push rod guides. The heavy crankshaft is provided with a pad for balancing. The heavy duty six-cylinder units have an extra large crankshaft of special design. All the main and connecting rod bearings are of the same diameter. The cylinder head is arranged to take double ignition if desired. The engine itself is arranged for both magneto and battery ignition. Full pressure lubrication is used throughout the engine.

The Novo Engine Company manufactures one, two and four-cylinder units ranging from 1½ to 50 h. p. The Novo 40 and 50-h.p. units are the slow speed, valve-in-head, four-cycle, water-cooled types. The "Rolls" series of Novo engines are equipped with Timken roller bearings and have several speeds in either direction. The power shaft is an independent takeoff. The clutches are of the enclosed disc type and are adjustable. They are L head, four-cycle, radiator and fan-cooled units.

The Hercules Motors Corporation manufactures four and six cylinder gasoline engines ranging from 20 to 115 h.p. There are a number of features to Hercules engines. The crankcase and cylinder block are combined. The water jackets extend the full length of the cylinder barrels. The cylinder heads are easily removable. The oil pan is of pressed steel with one horizontal and one vertical gasket. The oil pump is of the gear type. The pistons are of cast iron. The exhaust valves are of special high chromium, high silicon steel. The intake valves are solid forged chrome nickel steel. Both are equipped with removable guides. The manifold is the hot spot type.

Highway Research Board Meets

The Highway Research Board of the National Research Council will hold its Eighth Annual Meeting December 13th-14th, 1928, at the building of the National Academy of Science and the National Research Council, B and Twenty-first Streets, Washington, D. C.

The program includes committee reports and papers to be presented, covering the developments in the study of many problems of the highway industry, by specialists in the various lines.

VIBRATING SCREENS

—Their Application to the Screening of Damp, Sticky Materials

A. L. Adrianson,
General Manager and Chief Engineer Universal Vibrating Screen Company.

VIBRATING Screens are particularly well adapted to the screening of fine, damp materials and plant operators find in them a solution to one of their most difficult problems. Through their use, a higher quality product can be produced, output of plant can be increased and labor cost lowered.

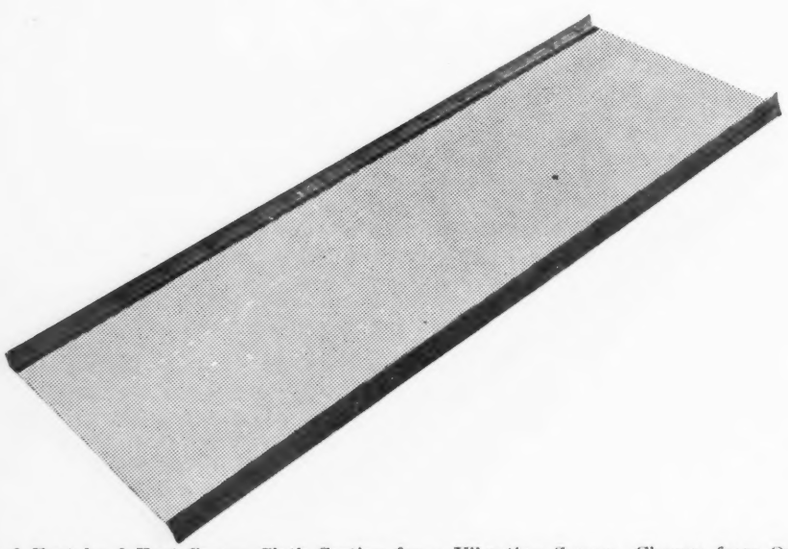
Any screening device for handling this class of material, to be entirely successful, must be able to handle a large capacity without blinding of the mesh, produce a clean, sharp separation at the size of openings used, and be so constructed that it will give many years of dependable, efficient service under all operating conditions.

There are several different types of vibrating screens on the market, in which the principles of operation differ somewhat, but producers of these screens endeavor to transmit a uniformly distributed and as intensive a screening action to the screen cloth as it will withstand, without being damaged.

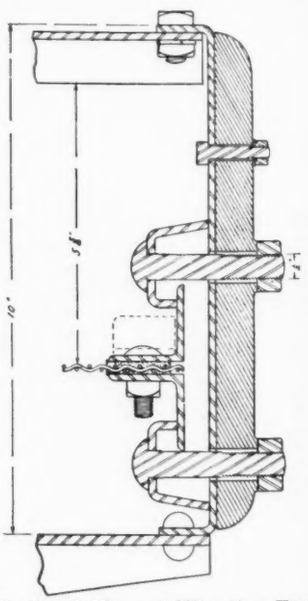
This, therefore, would indicate that there is a limit in the transmission of vibration to a screen cloth, beyond which no producer of vibrating screens can go, and such is really the case. The types of wire cloth best suited for use on vibrating screens are used, so that the most intensive screening action possible may be utilized. In a properly designed vibrating screen, the intensity of this vibrating action is of such proportions, that the most difficult materials are separated in a most efficient manner.

It is a comparatively simple matter to increase the vibratory action through mechanical means, but a limit must be maintained that is safe for the screen cloth and so that it will give a full measure of service before requiring replacement. There are many points in the design of a vibrating screen, not apparent to the casual observer, that are of the greatest importance in making it possible to attain the very highest point in screening efficiency through the application of the vibratory action without dangerous flexing of the wire cloth. These points in the construction of vibrating screens are learned in the school of experience, and only after years of careful study of various screening problems.

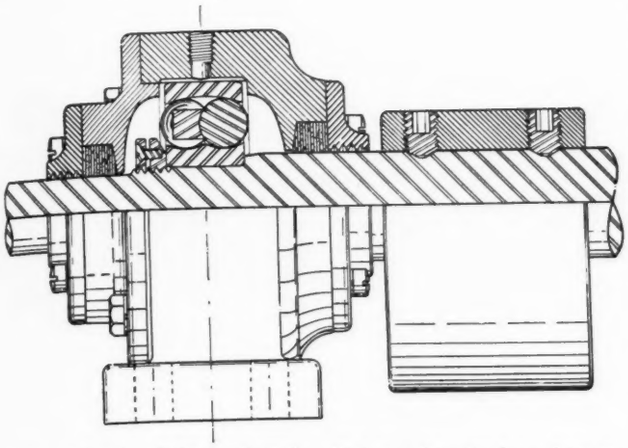
In that class of vibrating screens where the vibratory action is set up in a resiliently mounted frame, to which the screen cloth is attached,—through the use of off-center weight,—the material moves over the surface of the screen by gravity. As the material passes over the screening surface, the intensive vibration sifts out the fines and keeps the screen cloth from blinding. There naturally is a large saving in power through the use of the gravitation principle. It is important to install a screen of this type on the angle or pitch found best for handling each particular size and kind of material. This point is quite often overlooked by plant



A 3 Foot by 8 Foot Screen Cloth Section for a Vibrating Screen. Change from One Mesh to Another Can be Accomplished in Five Minutes, Is the Claim of the Manufacturer.



A Sectional View of Vibrating Frame of the Screen, Showing How Screen Cloth is Held in Place and Tension Adjusted.



Quarter Sectional View of Pulley End Bearing Used on Screen, Showing Combination of Felt and Labyrinth Packing, which the Manufacturers Claim, Positively Eliminates all Chance of Dust Reaching the Self Aligning Ball Bearings.

operators, where attention to this detail would very often result in much greater capacities and higher efficiency being obtained.

Whether a cloth with square or oblong openings should be used, depends on the nature of the material to be screened. A larger capacity can usually be obtained using screen cloth with oblong openings as there are fewer cross wires and therefore a larger percentage of open area. On material which when ground or crushed, is in a granular or globular form, this type of cloth works out very well and is preferred by many. When the material chips or is of flakey nature, a closer and more uniform sizing is obtained through the use of square mesh cloth.

The weight of wire cloth recommended by the manufacturer of the vibrating screen employed, should be used. The amplitude and intensity of the vibratory action in the unit is adjusted at the factory for the use of a certain weight of cloth, found through experience to be the best for each particular screening problem. If a heavier weight of cloth is used as replacement, there will be a corresponding loss in the percentage of open area, which will naturally reduce the output of the unit. Also, there is a greater percentage of wire surface from which the damp, sticky materials must be shaken clear, to avoid blinding. Medium weights of wire cloth are low in price compared to the heavier weights of wire cloth and in present day vibrating screens, where a change of screen cloth can be made quickly and easily, it is greatly to the operator's advantage, to use a screen cloth with as large a percentage of open area as possible, regardless of what mesh of cloth is used.

Care should also be taken to see that the full area of a screen is utilized, by discharging feed to screen on extreme upper end of screen cloth. No feeding device is necessary on a screen of thirty-six or forty-two inch width, as the vibratory action spreads the material over the full width of screen, the moment it strikes the screening surface. Where the material being fed to screen passes through a long steep chute, and attains considerable speed, or when discharged on screen from conveyor, it is well to arrange a small hopper or stop at this point, pocketing the material so that when leaving chute or conveyor it strikes upon itself and then drops lightly upon the screen cloth. Wear on the upper end of screen cloth is greatly reduced in this way.

Vibrators give a close, uniform separation that is most noticeable in the finished product, and have grown rapidly in favor with producers during the past few years. Instructions furnished by the manufacturer for the installation, operation and maintenance of these units should be followed carefully, for in that way the most efficient and dependable service will be obtained.

Self Regulation Approved

"Never in the history of American business has there been a time when self regulation has received more intensive consideration," declared M. Markham Flannery, director of trade practice conferences of the Federal Trade Commission, in an address to the fourth annual southern convention of the National Fertilizer Association.

"By self-regulation," Mr. Flannery asserted, "I mean workable rules prescribed by an industry for its own business conduct with a due regard for the public interest."

Mr. Flannery pointed out that if an industry is capable of self regulation, the trade practice conference procedure of the Federal Trade Commission affords the most effective method yet devised to accomplish this end.

"Self regulation without rules would be impossible," he declared, "and rules without some power of enforcement make self regulation in some instances a mere expensive gesture.

"The fact that some power rests, as it does, in some impartial, disinterested governmental body, obviates the necessity of its frequent use.

"This is demonstrated in that, of more than 300 rules adopted by industries in trade practice conferences, the power of the Federal Trade Commission has not been invoked with reference to a dozen of these."

Mr. Flannery explained that the primary interest of the commission naturally is the interest of the public.

"The public is entitled to the benefits that flow from competition," he said, "and competitors are entitled to fair competition.

"The legitimate interests of business are in perfect harmony with the true interests of the public.

"That which injures one undoubtedly injures the other; and Congress has, in the creation of this commission, provided a medium through which the interests of both may be mutually protected."

PIT AND QUARRY FOREIGN DIGEST

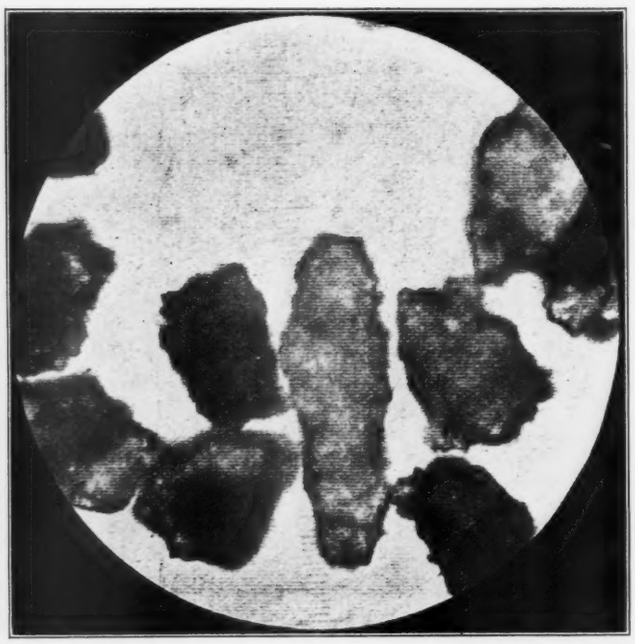


Figure 1.

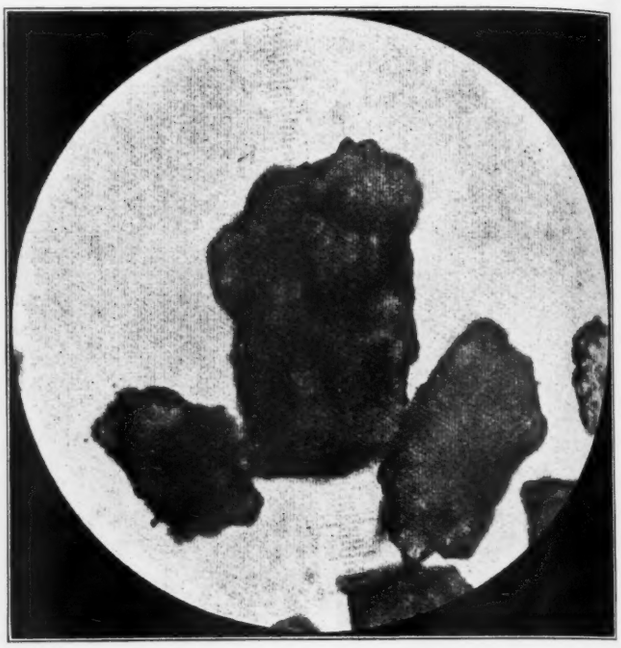


Figure 3.

Abrasion of Cements in Sieving

To obtain an accurate picture of the grain size of cement, it should be remembered that the smallest residue remaining on the sieve does not represent all of the particles originally present which will not pass through, as a considerable fining by abrasion has occurred during the sieving. The time of sieving is, therefore, an important factor and must not be extended. This is especially true of powders with a tendency to easy abrasion, such as raw slip. It seems desirable to make use of a time factor in determining grain size. In place of the American specification of 0.1 per cent in one minute, it is more convenient to use an interval of 2 minutes and 0.2 per cent passing through on the 10,000 mesh sieve, and 0.1 per cent on the 4,900 mesh sieve (per sq. cm.). A sieving machine must rub the particles as little as possible, and the values obtained must be reproducible. The machine used, in order to give the conditions outlined above must revolve at 190 rpm. for 30 minutes. When hand sieving is employed, the 10,000 mesh sieve should be used for 40 minutes, the 4,900 mesh for 20 minutes if a finer sieve has previously been used,

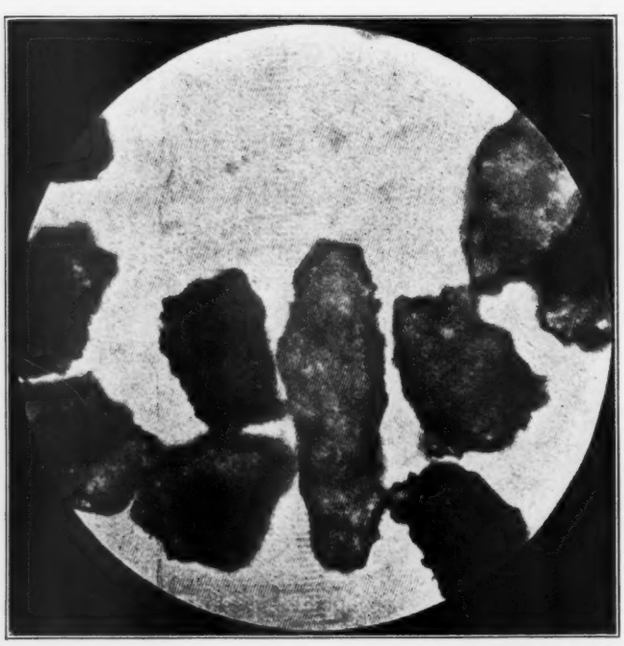


Figure 2.

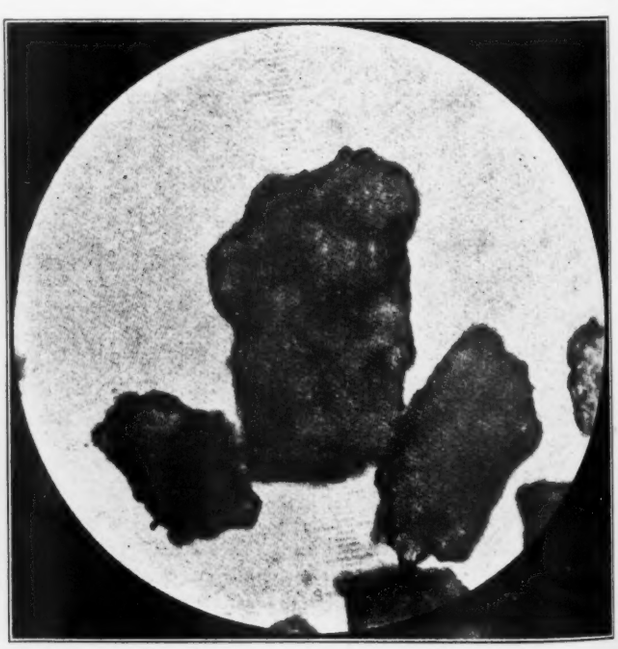


Figure 4.

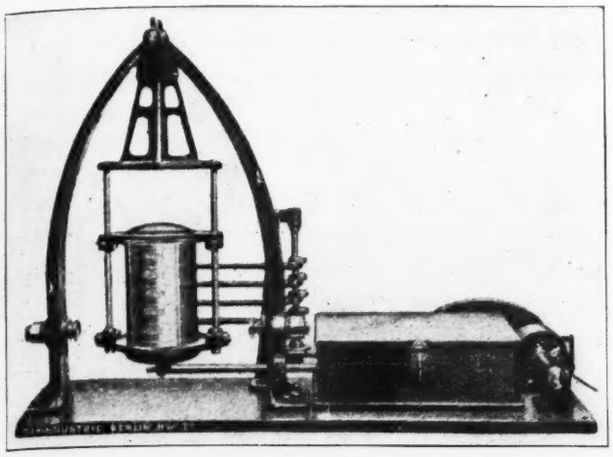


Figure 5.

and 25 minutes otherwise. The 900 mesh sieve is used for 3 minutes if a finer sieve has previously been employed, and otherwise for 5 minutes. The amount passing through each sieve should be weighed to 0.02 gram, and the residues estimated to 0.1 per cent. Duplicate tests should check within 1 per cent. The loss of material should not exceed 2 per cent with hand sieving or ½ per cent by machine sieving. Figures I, II, III and IV show microphotographs with a magnification of 368 as follows: I. After hard processing on 10,000 mesh sieve, for 80 minutes, microscope focused on the fines. II. Same focused on coarse particles. III. Shows material processed on sieving machine, 10,000 mesh for 70 minutes, focused on fines and V, same as III but focused on coarse particles. Figure V shows the sieving machine. Förderrenther and Haegermann—(Zement, November 8, 1928).

Acid-Proof Cement

A water glass solution is mixed with a powder containing substances such as tungstic acid, salts of fluorozirconic, fluorogermanic, fluoric, fluorotitanic, fluorotantalic, fluoroniobic and fluorostannic acids, Si, Si alloys, fluosilicates, cryolite or Al, having a strong capacity for combining with alkali as measured by the method described in Brit. 256, 258 (C. A. 21, 2972). Small quantities of these substances may be admixed with quartz sand for further admixture with water glass. I. G. Farbenind. A.-G. Brit. 283, 471. Jan. 8, 1927). C. A.

Recent Improvements in Cement

Perhaps the greatest improvement, if it may be so called, in modern cement manufacture during the past four or five years, is the invention, or rather evolution, of rapid hardening Portland cement, a material which bids fair to revolutionize all hitherto generally accepted ideas as regards rapidity of concrete construction. It may be confidently stated, that the main fact underlying the evolution and development of rapid hardening Portland cement, was the introduction from France some five or six years ago, of a cement called "Ciment Fondu." This cement possessed the remarkable property of developing within one or two days, as great a strength as ordinary Portland cement at 28 days; it also resisted the attack of sulphur impregnated waters, which it is well known, are fatal to the stability of ordinary Portland cement concrete. It is a somewhat curious fact that the research which led to the discovery of "Ciment Fondu" had for its original object an aluminous cement which would withstand sulphur impregnated waters, and its intensive rapid hardening properties which, on the whole, are far more important, were more or less an accident.

Although the cost of "Ciment Fondu" was, and still is, about double that of Portland cement, it will be readily understood that its value for street repair, and other work where time is the essence of the contract, far outweighed all such extra cost. It is well known that this cement is altogether different from Portland cement as regards color, chemical composition, and method of manufacture. In the first place, its color is almost black instead of blue-grey it is also a highly aluminous material, containing about 40 per cent of alumina, compared with the six per cent. to eight per cent. of Portland cement, while the lime and silica contents are correspondingly lower. The method of manufacture likewise, is altogether different, the raw materials, as the name suggests, being entirely melted or fusd in the process of chemical combination by burning, while with Portland cement the burning is carried only to the clinkering stage of incipient vitrifaction, and if melted or fused, the product would be practically inert and useless.

Present day rapid hardening Portland cement is greatly improved to what it was in the earliest stages of its evolution. When it was first produced on a commercial scale, the manufacturers would not guarantee a tensile strength at 24 hours of more than 400 pounds per square inch neat, and 200 pounds sand, and judging from the author's test books of that period, there was sometimes some little difficulty in reaching even those modest figures. At the present time, the strength and comentitious value of the material is nearly double that above mentioned, with progressive increase at the later dates.

The author emphasizes the fact that with present-day Portland cement, the structural engineer has at his disposal an infinitely stronger, better material than he had a few years ago, a result that is due partly to improved machinery, but more particularly to better all around control of the manufacturing process, in which the works chemist plays an increasingly important role. Looking back only to the first issue of the British Standard Specification in 1904, it is little exaggeration to say

that the average strength and cementitious value of present-day Portland cement is nearly double what it was then and this without taking into consideration the recently introduced rapid hardening Portland cement, a material which, judging from the progress made since it was first put on the market some three or four years ago, promises to become of increasing importance in the near future. D. B. Butler. (Structural Engineer, London, November, 1928).

Production of Alumina From Clay

Aluminiferous material, e.g., clay, is heated for several hours at 80-100 degrees with a deficiency of nitric acid to form basic aluminum nitrate, the solution is concentrated by partial evaporation, cooled to 0 degrees to crystallize the basic nitrate, and the product heated in vacuo with water or steam. M. Buchner. (British Patent 283, 117).

Coating Concrete With Metal

Spraying the surface of concrete with molten lead by the Schoop Process has provided a coating for concrete stable to heat and cold, moisture and dryness. It has been found in some cases that lead, in contact with concrete, in the presence of moisture, is decomposed with the formation of oxides and carbonates of lead. If the concrete surface is absolutely dry before being sprayed with molten lead, it is possible that an enduring and chemically resistant coating for concrete may be at hand. But it remains to be seen how stable this lead plating will prove to be. Anon. (Beton u. Eisen. Oct. 5, 1928.)

Permeability of Concrete

The permeability of concrete varies with the amount of cement and inversely with the amount of water. Stone dust, hydraulic lime, etc., have little effect, although up to 9 per cent $Ca(OH)_2$ is beneficial. Natural sand and gravel give better results than crushed rock. When specimens are stored damp the permeability is greater than when stored dry, although the former on drying out approach the latter. The penetration of water is faster at the start of the experiment and depends upon the pressure. Specimens stored 53 and 97 days gave similar results. A pitch coating withstood fairly high pressures, while bituminous coatings were sometimes helpful, sometimes not. Surfaces plastered with cement mortar withstood small pressures but not larger ones. A metal coating sprayed by the Schoop process withstood 15 atmospheres pressure. W. Hugentobler. Ber. Kommission Abdichtungen Schweiz.

Deterioration of Concrete by Corrosive Waters

The most important damage is caused by H_2SO_4 either combined in sea water or free in natural acid water. Ordinary concrete can be made resistant by producing a dense non-porous aggregate of uniformly sized material. At least 400 kg. of cement per sq. m. must be used. Painting with bitumen is beneficial and better than covering with clinker and cement. Aluminous cement with 7-50 per cent Al_2O_3 is very resistant to $MgSO_4$, but its behavior in presence of Na_2SO_4 is doubtful. The resistance of pozzuolana to corrosion is very great, as is shown by the existence of water mains in good condition today construced by the Romans of this material. The effect of its addition to concrete is to increase the density and to liberate lime, which acts protectively. It can only be used with slow setting concrete. Cements prepared from blast furnace slag fall into the same class; or a mixture of blast furnace slag and portland-cement clinker may be used. Those made from acid slags have not a high initial strength, but if the clinker content is low they are very resistant to salt water. Aluminous slags have the best "hydraulic" qualities of any, but are not so resistant to corrosion as might be expected. Basic and Mg slags also make good cement, but it is not resistant to salt water. Generally speaking, all these cements have less initial strength than Portland cement, but greater resistance to corrosion.

Wider Use of Asphalt

A notable feature of most of the Roads programs for the year is the wider use of asphalt. This is a result of efforts put forward by the National Roads Association of Australia to provide better roads by inducing the authorities to give preference to bituminous concrete roads or waterbound macadam roads coated with bitumen.

The amounts to be expended by several of Victorian Shire Councils on roads are given below; Phillip Island and Woolamai Shire to spend 45,190 pounds on main roads; Bremswick to borrow 120,000 for permanent road construction; Northcote Shire Council to borrow 50,000 pounds for construction and maintenance; Shire of Lylidale 12,000 pounds; and Broadmeadows 12,000 pounds. (Assistant Trade Commissioner, C. F. Baldwin.)

Watertightness of Concrete

The setting temperatures of normal and high quality Portland cements are not so high that cracks due to shrinkage after evolution of heat should occur, if they have been properly worked. Where a concrete will meet unusual tension and a special elasticity is desired, in order to avoid fissures, the addition of trass is to be positively recommended. Anon. (Zement, November 1, 1928).

PORTLAND CEMENT ASSOCIATION DISCUSSES PERTINENT PROBLEMS OF THE INDUSTRY

THE Twenty-sixth Annual Meeting of the Portland Cement Association was held in Chicago on November 19, 20 and 21. The Association, during the three days in session, was all business and the papers and discussions were the result of most careful thought, research and consideration. While it is one of the largest and probably the most carefully organized Association in the United States, it demonstrated beyond all cavil that it is organized only to serve the best interests of the entire nation rather than to be served.

Much more time was taken to discuss its responsibilities to the public and the welfare of its employees than was devoted to the problems involved in increasing profits. Topics such as "Accident Prevention," "Insurance" and "Welfare" as related to employees were subjects of considerable discussion. "Packing," "Transportation," "Conservation," "Elimination of Waste in Selling" and other matters of interest were discussed for the purpose of reducing overhead charges to be carried by its patrons, as well as "Advertising" to educate the public in the uses of cement and thus decrease the ultimate cost of construction. Of course, the technical problems received the attention that they deserved from a progressive Association and the members will return to their respective plants to accomplish more and greater work.

The papers relate only to the problems of the cement industry and are available to all members of the Association. The addresses of the preceding and succeeding presidents and the principal address at the banquet are of special interest to all, and the high points, as gleaned from those addresses, are presented in the hope that the attitude, as embodied in those addresses, may permeate the greatest number of people.

Just before the principal address of the evening by Mr. Cheney, B. F. Affleck, president of the Universal Portland Cement Company, presided at the burning of the last bond, issued to finance the erection of the Portland Cement Association Building in Chicago. This last bond was retired October 1, 1928.

Cement Activities in 1928

Estimating 1928 shipments of portland cement will total 175 million barrels, G. S. Brown, retiring president of the Portland Cement Association, declared in his annual address November 21 that in spite of the reduced rate of increase over 1927, there is no reason to believe the future outlook is affected. Mr. Brown spoke before the twenty-sixth annual meeting of the Portland Cement Association, in session at the Blackstone Hotel, Chicago, and attended by representatives of manufacturers who produce over 90 per cent of the cement shipped in the United States. The main theme of his address was a review of results of Association activity since the war.

"The reduced rate of increase reflects very definitely such factors as the slump in building awards during the latter half of 1927, which left a correspondingly smaller construction hang over for 1928. It does not mean that less new business has been developed during the present year or that the future outlook is affected. On the contrary, it is probable there will be a larger carry over for next year than was available for shipment in 1928.

"In a number of districts new producing capacity has come in and in all districts we are able to make considerably more of our product than we have been able to sell. Nevertheless, I am of the opinion that those companies whose properties are modern and commercially well located, are well supplied with raw materials and are well financed and managed, have in all districts but one shown satisfactory returns.

"This statement must be modified for those mills which ship largely into sea coast territory where low priced foreign cement has forced even the best equipped mills to sell for cost or less," he continued.

"Public confidence in an industry such as ours is largely a question of public understanding. The primary objective of our work has been service to the user. Appreciation on the part of users is unquestionably the greatest factor in the accumulation of public good will."

In this review he cited 290 million barrels of cement used in road and street paving in the last ten years and 6½ million barrels used in concrete sewer pipe in the last five years.

That Half Barrel of Cement

"A new era of vitality and usefulness is about to begin for the trade association—in which some of the shackles which have bound it will be loosened; in which the tremendous resources of the most prosperous government in the world will be at the service of industry; in which the Government will recognize what the trade association means and help it to mean more."

Such was the declaration of O. H. Cheney, vice president of the American Exchange Irving Trust Company of New York and member of the Trade Relations Committee of the United States Chamber of Commerce at the banquet.

GUY S. BROWN
President of the Portland Cement Association for 1928

FRANK H. SMITH OF NEW YORK
President-elect of the Portland Cement Association

"The greatest friend the trade associations of this country ever had," the speaker stated, "the man who fought for them when justice was not only blindfolded but deaf—the man who has forged the weapons of economic knowledge for business—has been elected to the Presidency of the United States."

He praised the cement association as "probably the biggest trade association in the country—an inspiring model for all industries. The cement industry has been magnificently successful in its warfare in the new competition."

He made a plea for improved trade practices in all industry, and sounded a note of warning against abuses likely to grow out of excess capacity to produce and the fear of idle machinery.

In pointing out some fundamental difficulties in the cement industry, Mr. Cheney called attention to the excess capacity but attributed the real problems of the industry to the fear of excess capacity. Practically all the troubles of the industry are due to half a barrel of cement, he said.

"It is the extra half barrel per capita which you have the capacity to produce. Fear of idle machinery is the cause of the craze for volume which seems to have afflicted a large proportion of our business population.

"What a good many cement men as well as others have forgotten," Cheney stated, in emphasizing that the top volume often yields no profit, "is that a billion times nothing is still nothing."

The speaker called upon all industries to work, through their trade associations, with the Federal Trade Commission and the Government in avoidance of the threatening destructive and cut-throat competition.

"The Commission is trying to build a practical structure of business based on cooperation—with a law designed primarily to uphold the idea that competition is the life of trade. The antiquated laws regulating business which are based on the economics of the horse-hair sofa and mustache-cup period must go," he stated.

"The more American business cooperates in building up the constructive work of the Federal Trade Commission by self-government, the sooner can we wipe out the destructive influences of the regulatory statutes.

"Now is the time to strengthen your organization for this most strenuous period of its existence," Cheney charged, in concluding his address. "You will need more research—the kind which developed high early strength concrete. You will need more promotion—the kind which is developing an almost immeasurable market by helping the farmer to work more efficiently and live more comfortably. You will need more education—the kind

which teaches every man who uses cement that the reputation of a vast industry is in the hands which control the mixing."

High Points in Address of President Elect

"There is danger of a severe rupture in the prosperity of the country if a broader and more unselfish attitude is not maintained in all industries," declared Frank H. Smith of New York in his speech of acceptance as new president of the Portland Cement Association.

"Voluntary curtailment of production in industries largely overbuilt is generally recognized as essential and necessary to the proper conduct and well-being of any given industry," the speaker continued.

He alluded to the over-built condition of the cement industry and the menace of imported cement as serious problems requiring the utmost cooperative effort on the part of Association members for equitable solution.

"We need a protective tariff, not a competitive one if the present wage scale and the American standard of living are to be maintained," Smith claimed. "We are entitled to this protection and I am of the opinion it will come to us if we can have the wholehearted support of the entire industry."

At the close of the meeting, a resolution was unanimously adopted calling upon the Ways and Means Committee of the House of Representatives and the Finance Committee of the Senate to undertake an immediate examination, in the next Congress, into conditions which justify a duty on cement. The threat to American standards of living of the imported product, produced under a wage scale many times lower than in America was emphasized.

Other officers elected at the meeting, besides Mr. Smith, included: Charles F. Conn of the Giant Company, first vice president; J. B. John of Sandusky, second vice president; John L. Senior of Consolidated, treasurer. Elected to the board of directors were: F. H. Powell of Southwestern; G. S. Brown of Alpha, the retiring president; A. C. Tagge of Canada; C. K. Boettcher of Colorado; E. M. Young of Lehigh; B. F. Affleck of Universal; Blaine S. Smith of Pennsylvania-Dixie; and M. J. Warner of the Nazareth company.

Rock Dust for Mines

With the approach of cold weather, and the consequent working of coal mines to full capacity, it is urgent that bituminous mine operators review their safety problems, with special attention to rock-dusting the mines as a means of preventing coal-dust explosions, warns Director Scott Turner of the United States Bureau of Mines. At this season, coal-mine passage ways tend to become dry with resultant dangerous accumulations of coal-dust. Rock-dusting is a proven method of preventing coal dust explosions, and mine operators who have not yet adopted rockdusting should by all means do so, both as a moral obligation and as a form of business insurance in the protection of life and prevention of destruction of property in their mines, Mr. Turner continues.

The Bureau of Mines has given detailed specifications for rock dusting bituminous mines in Serial 2606, "Tentative Specifications for Rock Dusting to Prevent Coal-Dust Explosions in Mines," and additional recommendations are given in Information Circular 6030, "Rock Dusting in Coal Mines," covering the American Engineering Standards Committee report.

The principal recommendations call for rock dusting in all passages or entries and in all rooms and pillar workings, to within forty feet of the face, the rock dust to cover top, floor, sides, and timber. As additional defense, Mine Safety Decision No. 5 of the Bureau of Mines also recommends: "That rock dust barriers be used to sectionalize the mine; these should not be regarded as a substitute for generalized rock dusting."

As concerns the size of particles of rock-dust, all should pass through a 20 mesh sieve, and 50 per cent or more should pass through a 200 mesh sieve; also the rock dust should not contain more than 25 per cent of free silica. A white dust like limestone or gypsum is preferable, as such dusts increase illumination.

The most important specification states that the percentage of inert or incombustible material in the mine dust in every part of the mine shall be maintained at least at 55 per cent or more, and in parts of the mine where methane is found in the ventilating current, the amount of incombustible material shall be raised 10 per cent for each one per cent of gas.

Improvement of Hydrated Lime

Producers of hydrated lime from quicklime have found occasionally that an undue amount of residue is obtained in the hydration process. This residue represents considerable loss as it has no commercial use and must be rejected. In an attempt to determine the cause of this residue, samples of quicklime have been obtained by the Bureau of Standards from producers who have unusually large amounts of unslakable residue. Analyses of the stone, quicklime, and residue have been made. A high calcium quicklime producing about 5 per cent residue was examined. It was found that practically all the magnesia had concentrated in the residue. Some concentration of silica also occurred. With a magnesium lime, the concentration of silica in the residue was more noticeable while little concentration of magnesia was evident.

INTIMATE NEWS OF MEN AND PLANTS

Universal Announces New Appointments

New appointments by the Universal Portland Cement Company, a subsidiary of the United States Steel corporation, were announced today by F. L. Stone, general sales manager of the company, as follows: R. H. Hoy, former division sales manager, sales manager, Pittsburgh; N. A. Kelly, former division sales manager, sales manager, New York; J. K. Hallock, former division sales manager, assistant sales manager, Pittsburgh; F. A. Brine, division sales manager, Pittsburgh, succeeding R. H. Hoy; W. H. McDowell, former sales agent, Cleveland, division sales manager, Pittsburgh.

"All the new appointees have been with the Universal company many years," Mr. Stone said. "Their long experience and familiarity with the work assure a continuance of the standards and service for which the company is known."

Huron Portland Opens Distributing Plant

The Huron Portland Cement Company with operations at Alpena and Wyandotte, Michigan, has opened its new 600,000 sack capacity distributing plant at Buffalo. The plant, of which Walter C. Nuhe is superintendent, was designed by A. C. Dane and erected by the John W. Cowper Company of Buffalo. The building, which is one of the six large distributing stations of the company, is reinforced concrete and is one of the most modernly equipped plants of its kind. The cement is packed as desired by automatic machines and shipped in cars, boats or trucks.

The first boat to unload its cargo in the new plant was the John W. Boardman which arrived on November 11 with 36,000 barrels of cement. In addition, two other boats, the Crapo with 42,000 barrel capacity and the Samuel Mitchell of 14,000 barrel capacity will serve the new distributing station.

Kentucky Rock Loses Brownfield on Vestris

W. A. Brownfield, on a trip to Brazil in the interest of the Kentucky Rock Asphalt Company, was lost in the Vestris disaster. Mr. Brownfield, who was chief engineer for the company, was accompanied by Mrs. Brownfield, who went down with him.

Crosly Lighterage Installs Ready Mix Plant

The Crosly Lighterage Company which operates gravel pits on Maury and Whidly Islands and at Hadlock, Washington, plans to erect a ready mixing plant and sand and gravel bunkers on block 70, Lake Union Shorelands, according to a recent announcement by Clyde Morrow, manager. The improvement will include 10,000 yards of storage capacity, two mixers and a large cement warehouse.

Ohio Plant Suffers Loss

The new plant of the Wapak Sand and Gravel Company, Wapakoneta, Ohio, which had been in operation only a week, recently suffered a $10,000 loss by fire. All motors and grading, washing and grinding machinery were destroyed. Immediate steps will be taken to restore the plant. The plant is owned by Lewis and Copeland, Lima, Ohio. H. Y. Miller is plant superintendent.

Pacific Coast Appoints Works Manager

The Pacific Coast Cement Company of Seattle, Washington, has appointed W. H. Green works manager, who will have charge of the new $3,000,000 plant now under construction. Mr. Green has had considerable construction and operating experience with the Knickerbocker Portland Cement Company, Iola Portland Cement Company and the Jubbelpore Portland Cement Company of India. The company has completed the installation of a 9 ton Milwaukee Electric bridge crane and a 13 ton Colby hammer head traveling crane.

New Kiln Installed

The Black Marble and Lime Company of Enterprise, Oregon, has completed the installation of a new lime kiln. There are now two kilns in blast and one is being overhauled and the three will be in operation as soon as practicable. The new kiln is equipped with a motor driven blower to increase the draught.

Southwestern Exploits Gypsum Deposit

The Southwestern Portland Cement Company of El Paso, Texas, is operating in a gypsum deposit near Anthony, New Mexico. It is stated that from 7 to 10 tons of gypsum is being shipped to the plant daily.

Fertilizer Company Leases Lime Deposit

The Holland Fertilizer C pany of Bellingham, Washington, ich is a new corporation, has leased a limestone deposit near Acme, Washington.

Marquette Cement Expands

The Marquette Cement Company, Cape Girardeau, Missouri, is to establish a southern distributing plant at Wolf River and Poplar Boulevard, Memphis, Tennessee. The Illinois Central railroad will construct tracks to the site.

Florida Portland Plans To Install Kilns

The Florida Portland Cement Company of Tampa, Florida, plans to install an additional kiln and auxiliary equipment to double the capacity of the plant.

Explosives Used in 1927

Reports, covering the calendar year of 1927 from manufacturing companies to the Bureau of Mines, show that the sales of permissible explosives amounted to 63,847,161 pounds, high explosives other than permissibles 303,467,767 pounds, and black blasting powder 131,696,200 pounds.

Coal mines used 85.5 per cent of all the black powder, 95.4 per cent of all the permissibles, and 11.3 per cent of all other high explosives used in the United States, during 1927 Stone Quarries and non-metallic mineral mines used 4.4 per cent of the black powder, 0.9 per cent of the permissibles, and 25.9 per cent of all other high explosives.

Russian Government Awards For Cement Plant

The Russian Government has awarded a contract for the construction of a cement plant near Novorossiska in the Ukraine. The contract for the plant, which is to have an annual capacity of 400,000 tons, has been awarded to the Frederick Krupp A. G. of Hamburgh, Germany.

Keystone Portland Purchases Valuable Property

The Keystone Portland Cement Company of Bath, Penna., has purchased the Themos Farm just west of its present plant.

Quite a Lot of Crushed Rock

It is a safe assertion that few people in the United States have a very definite conception of the enormous amounts of crushed rock produced annually in the country. According to a recent announcement by the United States Bureau of Mines, Department of Commerce, 95,000,000 short tons of crushed stone were produced by the Nation in 1927. This quantity of crushed rock, considering that the rock weighs 165 pounds to a cubic foot, would mean a cube of solid rock about 1050 feet, or 1/5 of a mile on an edge, that is, a cube whose edge is almost twice as high as the Washington Monument, or 1½ times as tall as the Woolworth Building. If it were made into a mass 10 feet square, it would reach approximately 2200 miles, or about the distance from Chicago to San Francisco. It would make an automobile road composed of a solid sheet of rock 20 feet wide and a foot thick which would reach from the most northern coast of North America to the South Pole. If it were made into a single piece one foot square, it would reach around the globe almost nine times. In other words, it would make a stone sidewalk almost 9 feet wide and 1 foot thick the entire distance around the earth at the equator. To be crushed during the year, this sidewalk would have to be fed into an enormous crusher about as fast as a man walks, or at the rate of about 260 feet per minute, a mile every 20 minutes, night and day, holidays and Sundays.

Idaho Cement Construction Progresses Rapidly

Construction of the new plant of the Idaho Portland Cement Company at Inkom, Idaho, is progressing rapidly according to E. J. Simons of Spokane, Washington, president of the company. Full operation is expected by March 15 of next year. The General Construction Company of Chicago has the general contract.

Quarry Accident Statistics

The accompanying statistical tables, containing information concerning accidents in the stone-quarrying industry in 1927, are published in mimeographed form at this time by the United States Bureau of Mines, Department of Commerce, in order to make the figures available to the industry as early as possible. A more extended report will be issued later, copies of which may be had upon application to the United States Bureau of Mines, Washington, D. C.

Table 1.—ALL QUARRIES: Men employed, days of labor performed, and number killed and injured in quarries in the United States, by States.

State	Active operators	Men employed	Equivalent in 300-day workers	Man-days of labor	Average days active	Number killed	Number injured	Rates per thousand 300-day workers: Killed	Rates per thousand 300-day workers: Injured
Alabama	23	2,004	1,918	575,330	287	3	194	1.56	101.15
California	119	5,570	5,287	1,586,081	285	13	933	2.46	176.47
Colorado	18	1,316	1,111	333,461	253	...	147	....	132.31
Georgia	22	2,974	2,788	836,269	281	2	468	.72	167.86
Illinois	47	4,105	3,644	1,093,179	266	5	483	1.37	132.55
Indiana	42	5,491	5,064	1,519,272	277	10	812	1.97	160.35
Iowa	21	1,489	1,178	353,538	237	...	265	....	224.96
Kansas	18	1,301	1,143	342,815	264	...	93	....	81.36
Kentucky	31	1,084	833	249,945	231	1	271	1.20	325.33
Maine	28	1,589	1,433	429,762	270	5	289	3.49	201.67
Maryland	25	1,509	1,294	388,121	257	1	111	.77	85.78
Massachusetts	59	2,513	2,306	691,747	275	3	806	1.30	349.52
Michigan	19	2,352	2,150	644,909	274	3	271	1.40	126.05
Minnesota	34	1,403	1,217	365,232	260	2	370	1.64	304.03
Missouri	54	3,984	3,283	984,946	247	3	563	.91	171.49
New Jersey	37	1,943	1,747	524,025	270	3	204	1.72	116.77
New York	90	5,297	4,641	1,392,255	263	7	872	1.51	187.89
North Carolina	11	1,546	1,263	378,984	245	4	121	3.17	95.80
Ohio	88	6,813	6,142	1,842,592	270	10	1,234	1.63	200.91
Oklahoma	12	1,130	1,130	338,926	300	3	169	2.65	149.56
Pennsylvania	262	15,926	14,609	4,382,716	275	24	2,065	1.64	141.35
Tennessee	27	2,624	2,446	733,718	280	6	315	2.45	128.78
Texas	24	1,742	1,809	542,623	311	3	287	1.66	158.65
Vermont	49	4,575	4,513	1,353,846	296	6	581	1.33	128.74
Virginia	46	2,390	2,131	639,339	268	4	269	1.88	126.23
West Virginia	18	1,786	1,637	490,963	275	4	146	2.44	89.19
Wisconsin	62	2,130	1,885	565,564	266	3	452	1.59	239.79
Not segregated	148	4,931	4,007	1,202,403	244	7	668	1.75	166.71
Total	1,434	91,517	82,609	24,782,561	271	135	13,459	1.63	162.92
Total previous year	1,519	91,146	82,361	24,708,400	271	154	13,201	1.87	160.28

Table 2.—ALL QUARRIES: Men employed, days of labor performed, and number killed and injured in quarries in the United States, by kind of quarry.

Kind of Quarry	Active operators	Men employed	Equivalent in 300-day workers	Man-days of labor	Average days active	Number killed	Number injured	Rates per thousand 300-day workers: Killed	Rates per thousand 300-day workers: Injured
Cement rock	98	23,220	24,237	7,271,158	213	13	1,676	0.54	69.15
Granite	253	11,034	9,073	2,721,721	247	23	1,977	2.53	217.90
Limestone	715	39,269	33,765	10,129,463	258	73	7,069	2.16	209.36
Marble	33	6,153	5,912	1,773,424	288	5	738	.85	124.83
Sandstone and bluestone	155	4,150	3,321	996,429	240	5	631	1.51	190.00
Slate	67	3,736	3,196	958,760	257	7	589	2.19	184.29
Traprock	113	3,955	3,105	931,606	236	9	779	2.90	250.89
Total	1,434	91,517	82,609	24,782,561	271	135	13,459	1.63	162.92

Table 3.—ALL QUARRIES: Men employed, days of labor performed, and number killed and injured in quarries in the United States during the year.

Kind of Quarry	Men employed	Equivalent in 300-day workers	Man-days of labor	Average days active	Number killed	Number injured	Rates per thousand 300-day workers: Killed	Rates per thousand 300-day workers: Injured
All quarries:								
In quarry	49,549	41,421	12,426,312	251	99	8,015	2.39	193.50
Outside	41,968	41,188	12,356,249	294	36	5,444	.87	132.17
Total	91,517	82,609	24,782,561	271	135	13,459	1.63	162.92
Dimension stone:								
In quarry	12,050	10,365	3,109,576	258	23	2,068	2.22	199.52
Outside	9,863	9,317	2,795,006	283	8	1,676	.86	179.89
Total	21,913	19,682	5,904,582	269	31	3,744	1.58	190.22
Non-dimension stone:								
In quarry	31,219	26,232	7,869,404	252	67	4,959	2.55	189.04
Outside	29,186	29,449	8,834,776	303	22	3,110	.75	105.61
Total	60,405	55,681	16,704,180	277	89	8,069	1.60	144.91

Table 4.—ALL QUARRIES. Fatality and injury rates* per thousand 300-day workers in the United States during the years ended December 31, 1924 to 1927.

	Killed				Injured			
	1924	1925	1926	1927	1924	1925	1926	1927
All quarries:								
In quarry	1.90	2.28	2.58	2.39	178.00	195.02	187.46	193.50
Outside quarry	1.24	1.22	1.11	.87	170.61	141.06	131.01	132.17
Total	1.63	1.78	1.87	1.63	175.03	169.67	160.28	162.92
Dimension stone:								
In quarry	1.28	1.94	2.50	2.22	160.71	180.60	170.73	199.52
Outside quarry	.81	.57	.61	.86	211.05	197.61	168.80	179.89
Total	1.14	1.40	1.70	1.58	175.89	187.35	169.91	190.22
Non-dimension stone:								
In quarry	2.25	2.59	2.64	2.55	189.04	193.41	191.97	189.04
Outside quarry	1.41	1.34	1.28	.75	156.02	120.99	116.75	105.61
Total	1.88	1.95	1.94	1.60	174.48	156.64	153.08	144.91

*Rates are based upon all lost time accidents.

Bulk of Asphalt Comes From Petroleum

The principal source of the asphalt so largely used in the construction of the nation's highways is thought by many to be the famous pitch lakes of Trinidad, but the fact is that asphalt derived as a product in the refining of petroleum far outranks other asphalts in importance, according to "Asphalt and Related Bitumens in 1927" by G. R. Hopkins and A. B. Coons of the United States Bureau of Mines, Department of Commerce. The total value of the yearly sales of petroleum asphalts is nearly ten times that of native asphalts and related bitumens.

Very little petroleum asphalt was manufactured before the twentieth century as the asphaltic materials that were obtained as residuals by refining were of inferior quality. With the rise in production of asphaltic base petroleum in California during the early part of the twentieth century, the discovery of the beneficial results obtained by the use of steam in refining, and the growth of asphalt in public favor as a road-building material, the petroleum asphalt industry was placed on a firm basis and grew rapidly. A further impetus was supplied when Mexican petroleum, which has a high asphalt content, was imported in quantity for the first time.

The good roads demanded by the millions of motorists in the United States have proved a boon to the asphalt industry, particularly to manufacturers of paving asphalts. Asphalt is chiefly used in paving and, although subject to keen competition from cement, and coal tars, has grown in favor. Paving has not been the only important factor in the growth of the asphalt industry, however, as much asphalt is used for roofing and waterproofing purposes, felts and burlaps being saturated or coated with asphalt.

The term "asphalt" is commonly used to denote the various forms of bitumen found in nature or produced by refining. The term includes: Native asphalt, which in the United States is generally associated with other mineral matter, such as limestone and sandstone, and is usually called bituminous rock; the "related bitumens"—a series of natural hydrocarbons, of which only gilsonite, grahamite, ozokerite, and wurtzilite (elaterite) are of commercial importance; and petroleum asphalt, the major class, obtained in the refining of oils of an asphalt base or a mixed asphaltic and paraffin base. Native asphalt of the "pitch like" type is not found in the United States in sufficient quantities to compete with the celebrated Trinidad and Bermudez Lake deposits, which together supply nearly all of the asphalt imports of this country.

The term "bituminous rock" is used to designate all kinds of rock, whether in a friable or solid state, that contain an appreciable quantity of bitumen or asphalt intermingled in the stony particles. Bituminous rock therefore includes asphaltic earth, sand, sandstone, shale and limestone, of which asphaltic sandstones and limestones are the most important.

Bituminous rock with a wide range of bitumen content is found in many parts of the United States, but the most important commercial deposits are found in the western half of Kentucky, in Uvalde County, Texas, in southern Oklahoma, in Colbert County, Ala., and in the vicinity of Santa Cruz, Calif. Only the first two are worked extensively.

Nearly all the bituminous rock produced in Texas consists of impregnated limestone, whereas the major portion of the Kentucky product has for its base the Potsdam sandstone, the superior wearing qualities of which are stated to be the reason for the higher average value given the Kentucky product. Discounting this alleged superiority in wearing qualities it is undoubtedly true that the Kentucky producers have several economic factors in their favor, such as nearness to markets and absence of competition from petroleum asphalt.

Bituminous rock is used chiefly in paving. For this purpose a rock consisting of at least 6 per cent asphalt is quarried and by means of a series of crushings and mixings is brought to the proper consistency for direct application. Except for the fact that it is hard to handle in cold weather, bituminous rock undoubtedly has superior qualities as a road-surfacing material.

Gilsonite, or uintaite, is found in the United States only in a narrow strip along the Colorado-Utah border. It occurs in veins, many of which are several feet wide and several miles long. Gilsonite is used chiefly in the manufacture of paints and varnishes and as it possesses the property of rendering rubber resistant to oxidation and changes in temperature is used in the rubber trade as a substitute for carbon black.

Grahamite, though widely distributed in the United States, does not occur in deposits of sufficient size to allow competition with other materials used for the same purpose; that is, in roofing. No commercial production of grahamite has been reported since 1924.

Ozokerite, or mineral wax, is found in the United States only in Utah, in Wasatch and Utah Counties. Ozokerite, by reason of its high melting point, has several special uses for which ordinary wax obtained from petroleum would be unsuitable. It is used chiefly as a substitute for paraffin wax in the manufacture of paper to cover products, which are wrapped before cooling, such as bread, as the principal constituent in high-grade wax candles, and in polishes.

New Corporations

Holland Fertilizer Co., 206 Long Bldg., Bellingham, Wash., $50,000. E. F. Williams, W. W. Fairburn, Bellingham; W. C. Dice, Seattle. To manufacture fertilizers. Limestone deposits near Acme, Wash., have been leased, and the lime will be used as the fertilizer base.

Columbia Sand & Gravel Co., Middletown, Ohio. $20,000. J. R. Hunter, John E. Miller, W. C. Stanley, John W. Bair.

Texas Nitrate Corp., L. D. Brown, First Nat. Bk. Bldg., Houston, Tex. $75,000. J. V. Chapman, J. E. Cabiness.

Crown King Mines Corp., R. F. D. 3, Landover, Md. 200 shares pfd., $50 each; 800 shares com. n.p.v. Mining and quarrying. Anton Roeser, G. H. Schwarz, John F. Hefferman.

Arkansas Marbles Corp., 204-5-6 Boyle Bldg., Little Rock, Ark. 2000 shares n.p.v. Wm. T. Hammock, Sec.-Treas.; Lee Y. Casey. Own deposits of black, gray, and blue marble, phosphate rock, building stone and shale.

Washington County Sand & Gravel Co., 904 Terminal Bldg., Lincoln, Neb. $20,000 to be invested at Hanover, Kans. John Westover, Pres.; Ernest Rokahr. V. P.; Geo. Rokahr, Sec.

Acme Sand & Gravel Co., c/o Allen H. McCurtain, Porter Bldg., Portland, Ore. $85,000. Dredging operation. T. G. Patterson, B. Lee, Allen H. McCurtain.

Geo. D. Littell, Inc., Livingston, N. Y. 100 shares n.p.v.

Wink Gravel & Clay Co., Wink, Tex. $1,000. G. F. Bates, W. L. Bates, Lilly Bates, all of Odessa, Tex.

Southland Gravel Co. of La., Osyka, Miss. $100,000. C. J. Thomas, Osyka, Miss.; S. A. Gano, New Orleans, La.

East Hartford Sand Co., Louis Silvestri, East Hartford, Conn. $50,000.

Copemish Gravel Co., c/o Colonial Charter Co., Wilmington, Del. $350,000.

Northern New Jersey Asphalt Corp., Hackensack, N. J. $200,000.

NEWS OF EQUIPMENT MANUFACTURERS

Pennsylvania Cement Plant Contracts Let

The Basic Products Company, which is building a cement plant at Neville Island, Pennsylvania, as part of the project of the Davison Coke and Chemical Company, recently awarded a number of contracts. The construction program includes a cement plant, a battery of byproduct coke ovens, a new power plant and a dock. The dock will be built by the Dravo Contracting Company of Pittsburgh, and building foundations by the Rust Engineering Company, also of Pittsburgh. The contract for slurry filters has been awarded the Oliver United Filters Corporation, and the Allis Chalmers Manufacturing Company will furnish the cement mill machinery. The MacDonald-Spencer Engineering Company, New York, will furnish plans and engineering of stockhouse as well as plans for all mechanical equipment.

Botfield Appoints

Botfield Refractories Company, Philadelphia, Pa., manufacturers of Adamant fire brick cement; Adamant-Adachrome super-refractory mixtures and the Adamant gun, announces that The Marshall Supply Company, Incorporated, operating in Pittsburg, Kansas, and Tulsa, Oklahoma, has been appointed a distributor.

Fulton Iron Works Elects

The Fulton Iron Works of St. Louis, Missouri, has announced the election of F. Edward O'Neil to be vice president and general manager. Mr. O'Neil has been with the company since 1905 and for the past 11 years has been in charge of the New York City Office.

Huron Industries Opens Chicago Office

H. W. Munday has been appointed general sales manager of Huron Industries, Inc., manufacturers of seal rings and speed reducers. The general sales offices have been moved from Alpena, Michigan, to the Builders Building, Chicago. Mr. Munday is a graduate engineer of Purdue University and Armour Institute of Technology. For the past five years, Mr. Munday has been editor-in-chief of Pit and Quarry, Pit and Quarry Handbook and the Fertilizer Green Book, which position he resigned befor accepting his new connection.

Jeffrey Appoints Boston Manager

The Jeffrey Manufacturing Company of Columbus, Ohio, announces that Stanley M. Mercier has been appointed manager of its Boston Office at 141 Milk Street.

Erie Opens Chicago Office

The Erie Steel Construction Company of Erie, Penna., has established an office in the Engineers Building, Chicago, Illinois. The office is in charge of O. H. Watson, who has had considerable experience with Erie products.

New House Organ

Hydraulic Hoist Manufacturing Company, St. Paul, Minn., publishes a very interesting organ, "The Dump Truck on the Job." Each month the booklet contains material of interest to dump truck owners and operators.

Universal Makes Improvement In Vibrating Screens

The Universal Vibrating Screen Company of Racine, Wisconsin, has recently made some improvements in its type "C" universal. It has previously been manufactured in a size having only a 3 by 8 foot screening surface as that size had been found to meet more nearly the requirements of the industries.

Occasionally, an installation is desired in a space where the headroom is limited and to meet this condition, a new and shorter screen has been designed. The new screen, which has a screening surface 3 feet wide and 6 feet long, will be found adaptable to such conditions where the older type could not be used.

Improvements in the design of bearing housings have been made by the engineering department, which it is pointed out makes the entrance of dust into the self aligning ball bearings an impossibility, regardless of conditions under which the screens operate. This is accomplished by the use of wool felt and labyrinth seals, which the manufacturer claims eliminates all danger of dust entering the bearings. All Universal screens are equipped with the new dust tight bearings.

An Improved Vibrating Screen

Shaffer Joins Bartlett and Snow

Effective November 7th, L. S. Shaffer joined the organization of the C. O. Bartlett and Snow Company of Cleveland. Mr. Shaffer was formerly general manager of Byers Machine Company, Ravenna. He will be in charge of the sales and development of the truck body Bartlett and Snow is building for the transport of premixed concrete. The sale of this body will be handled outside of the regular Bartlett and Snow sales organization, the present plan being to distribute this product entirely through dealers in contractor's equipment and through manufacturers of motor trucks.

New Hoist Catalog

Hydraulic Hoist Manufacturing Company, St. Paul, Minn., has issued a new catalog of St. Paul Hydraulic Hoists. It is a beautiful and instructive book, illustrating and describing the various important mechanical features of the hoist, complete and in detail.

Chain Belt Appoints Sales Manager

W. B. Marshall has recently been appointed sales manager of the Contract Engineering Department of the Chain Belt Company, Milwaukee, Wisconsin. He has been associated with the company since 1921, when he was graduated from the Sheffield Scientific School of Yale University. He entered its employ as a student apprentice and after several years' work in the shops and foundries was made secretary to the general manager and later spent some time in the Chicago office. In 1926 he returned to Milwaukee and was engaged in contract engineering sales work.

High Speed Heavy Duty Truck Announced by White

The White Company, Cleveland, Ohio, is distributing a circular describing the new Model 58 three ton high speed heavy duty truck. This model is standard equipped with pneumatic tires and electric lights, but is also made with solid tires and Prest-O-Lite equipment. The chassis weight is 7500 pounds. Optional equipment consists of a cab, electric starter, heavy duty auxiliary transmission which furnished a fifth speed and additional pulling power for heavy going, a high speed reverse, full power take-off or special counter shaft take-off, and Westinghouse air brakes.

The power plant is a four cylinder White GRB engine with a 4¼ inch bore and 5¾ inch stroke. The engine, clutch and transmission are all embodied in a unit power block. Detachable plates give easy access to internal parts such as valve stems and push rods. Lubrication is by pressure feed to main, camshaft, connecting rod and piston pin bearings, and the pistons and cylinders operate in a constant spray of oil.

The water cooling system has a positive water circulation by a gear driven centrifugal pump. The radiator has a cast aluminum casing with a removable cellular core and is mounted on spherical seats with spring retention and three point suspension to eliminate strains. Gasoline feed is by vacuum system from a 34 gallon tank.

The clutch is of the single plate type operating in oil, the rotating parts together with the flywheel assembly being carefully balanced. The transmission is the selective type with four speeds forward and one reverse. Gears are made of drop-forged heat treated alloy steel. The frame is of 8 inch pressed steel, heat treated channel section with reinforced webs and heavy channel section cross members.

The rear axle is of the double reduction gear drive type with the first reduction by bevel gears in the center of the rear axle and second reduction by spur gears in the rear wheels. Power is transmitted to the rear axle through a tubular drive shaft with all metal oil lubricated joints. The axle is full floating and the axle housing is a one-piece heat treated steel casting. The rear axle ratio is 7.6:1 standard 5.8:1 and 7.7:1 optional. Clearance is 11½ inches minimum and 13½ inches with 40 by 10 high pressure pneumatic tires. The front axle is the Elliot type and has a minimum road clearance of 13 inches.

The service brakes, which are of the external contracting type operated by foot pedal, are mounted on the drive shaft and are supported by a cross-shaft located in brackets on the frame. The emergency brakes are operated by hand lever and are of the internal expanding type located in drums on the rear wheels.

Springs are semi-elliptic front and rear with two stage springs at the rear. The wheels are demountable and are the cast steel spoke type. The steering gear is a special worm and sector type with adjustable ball thrust bearings. Regular equipment includes front fenders, horn, two acetylene gas headlights, oil tail light, toe boards, and a full set of tools.

High Speed Heavy Duty Truck

A Crusher Bulletin

The Traylor Engineering and Manufacturing Company of Allentown, Pennsylvania is distributing Bulletin No. 2099, which supersedes Bulletin No. 1099. Twenty-one pages are used to illustrate and describe the different bull dog jaw crushers, two pages of data and tables for determining the proper screen sizes and perforations and two pages consist of line drawings to assist in designing an efficient crushing plant.

The frame of the bull dog crusher is made of semi-steel, annealed in the sand and is of box section design with a uniform thickness of metal and relieved of tension by two bands or links, one shrunk around the receiving opening and the other around the bottom of the frame. The swing jaw is made of annealed open hearth cast steel and has necessary lugs cast integrally for attaching the spring rods. The jaw bearings are cast integrally with the upper link and lined with high grade babbit, channeled for grease lubrication and fitted with caps. The pitman is of composite construction, simple and relatively light but of sufficient strength.

Bearings for the pitman shaft are of the ball and socket type. The pitman cap is made of annealed open hearth cast steel, water jacketed with inlet, outlet and drain. The jaw plates are made of chilled Mayari iron or manganese steel as the service requires and each plate is made in one or more sections, reversible bottom to top for maximum wear. The fixed jaw plate is zinced in place in the front end of the frame and cored holes are provided for the bolts holding it in position. It is further secured by two annealed open hearth cast steel retainers. The toggle system is of a three contact design, with seats easily replaced. A spring jack is placed between the pitman bottom cover and the top of the front toggle to prevent the front toggle from lifting off its seat on the down stroke. The crusher is fitted with a patented safety device for protecting all parts of the machine from injury if the pitman rods are overloaded by tramp iron being introduced with the feed or the packing of the discharge opening with damp or sticky material. All materials used in building these crushers are of high grade and the design and workmanship is said to be of best quality. All machinery is done to template and gages, insuring interchangeability.

Use of Cotton Bags In Cement Industry

Increased demand for cotton containers for the shipment of cement has been noted in recent months, according to reports received from manufacturers by the New Uses Section of The Cotton-Textile Institute, Inc., in a study of this use of cotton which has just been completed.

One of the principal reasons for this pronounced trend toward cotton bags is the economy to the users. Where economy and durability are essential cotton bags have distinct advantages that are responsible for their present extensive use according to Ernest C. Morse in charge of the New Uses Section.

"For a number of years cloth bags have been used as containers for cement in far greater proportion than any other material," Mr. Morse states. "It is estimated that about 250,000,000 cloth sacks are used annually in making shipments of cement in this manner. For replacements approximately 60,000,000 bags, equivalent to 60,000,000 square yards, are required each year.

"The Portland Cement Association last estimated that more than half the cement used in this country each year is required in the construction of public and commercial buildings, in paving and highways. The former represents 26 per cent of the annual consumption, the latter 27.5 per cent. Other channels of consumption were estimated (in percentage) as follows:

Houses (exclusive of rural)	8.5
Sidewalks and driveways (exclusive of rural)	5.5
Small town and farm uses	18.
Sewerage, drainage, irrigation, culverts, etc.	4.5
Railways	5.5
Bridges, rivers, harbors, dams, reservoirs, etc.	3.
Miscellaneous	1.5

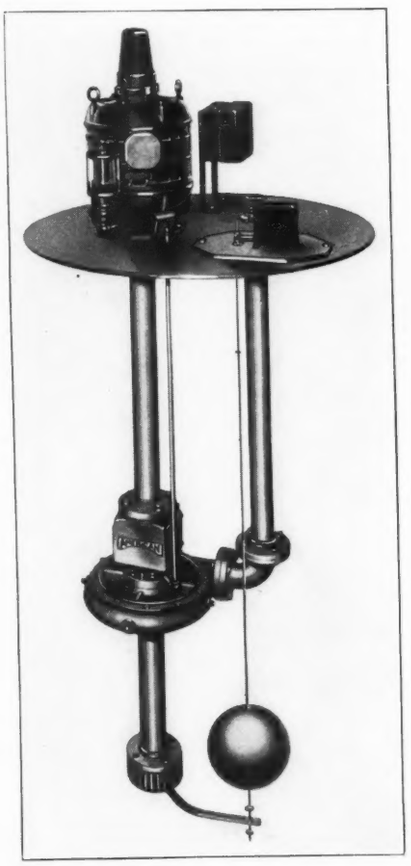
"On the basis of these ratios, it is apparent that the general building contractor, who is concerned with construction of public and commercial buildings and uses, takes more than one third the annual consumption of cement. Other contractors specializing in paving, highway, sewerage, irrigation, etc., account for almost another third.

"To manufacturers of cotton bags and bagging it is significant that these two classes of consumers are strongly in favor of cloth sacks for the cement required in their operations.

"In a recent study it was found that of 367 contractors, from representative sections of the country, 220 stated their preference for cloth bags; 75 used both cloth and paper.

"The principal advantage cited by contractors and others in favor of cloth bags is that they are cheaper. Those engaged continually in construction work on a large scale are accustomed to give the utmost consideration to costs and for this reason understand the economy in the use of cotton sacks. They also prefer cloth sacks because there is less breakage, consequently less loss of cement, and such bags can stand rough handling.

"Inquiry among state highway departments in 15 states reveals that cotton cloth is specified almost exclusively for the shipment of cement. In New York and Illinois cloth containers are compulsory. These reports from highway engineers show that cotton bags are used extensively in Michigan, Texas, Maryland and Ohio; their use is predominant in Iowa, New Jersey, Georgia and California.



A New Sump Pump

The American Well Works has just announced a new and improved line of sump pumps having many advantages over its old type. This line, besides being self-controlled, is efficient and is sturdily built to meet the unusual in service and to stand up under abuse.

The "American" type M. M. D. sump pump differs from its other motor driven pumps in that it employs a hollow shaft motor in place of the old solid shaft type. The pump shaft extends up through the motor shaft, hence both motor and pump use the same thrust bearing which is mounted in the upper end of the motor, making adjustments very easy.

The elimination of high motor supports is made possible as the pump supporting pipe is bolted through to a cast iron plate that in turn bolts to the motor. Regardless of distortion in the pit cover, the alignment of the pump and motor is not affected.

The pump shaft bearings consist of removable bushings. The pit plate is made of plate steel and is furnished either round or square. Pump may be had for all standard settings up to 17 feet in either single or duplex units. All units are furnished complete with float control switch, oiling device and motor. The American Well Works has published complete specifications and catalogs covering this type pump.

Speeder Machinery Corporation at Road Show

The Speeder Machinery Corporation, Cedar Rapids, Iowa, manufacturers of the Speeder convertible excavator, will occupy space AA-24 at the Road Show, Cleveland, January 14 to 18 inclusive, 1929. The Speeder exhibit will include Speeder dragline and shovel buckets as well as the complete units.

Those in attendance will be: George T. Ronk, president and general manager; Carl Monroe, vice president and treasurer; T. M. Deal, secretary and sales manager; Walter Baker, production manager; Glen D. Cooper, assistant sales manager; Edgar McNall, advertising manager; L. A. Bartlett, export manager; B. W. Olin, district sales engineer, New England territory; H. W. Parsons, district sales engineer, Pacific Northwest territory; W. H. Boyd, district sales engineer, Southern territory; R. L. Coop, district sales engineer, Southwestern territory; and A. D. Lane, district sales engineer, Northern territory. The Speeder headquarters will be the Hollenden Hotel and the exhibit will be in charge of Troy M. Deal, sales manager.

Material Service Buys Additional Acreage

The Materials Service Corporation of Chicago has recently purchased 80 acres of land on 47th Street near Lyons, Illinois, on the South where a stone quarry and material yard are in process of development.

National Equipment Acquires Additional Control

Further combinations in the construction equipment field were announced recently by Philip A. Koehring, president of the National Equipment Corporation, in the acquisition of the Parsons Company, Newton, Iowa, manufacturers of power trench excavators, and the Insley Manufacturing Company of Indianapolis, manufacturers of steel towers for hoisting and pouring concrete.

Both companies will continue under their present management as divisions of the National Equipment Corporation. H. C. McCardell, president of the Parsons Company, and W. H. Insley, president of the Insley Manufacturing Company, become vice presidents and directors of the parent corporation.

With the addition of these two companies, National Equipment becomes one of the leaders in the construction machinery field. The Corporation now owns four member companies—Koehring Company, T. L. Smith Company, Insley, and Parsons, with total assets of $9,000,000 and 1928 sales close to $10,000,000. Products of the member concerns are sold in every state of the Union and many foreign countries. Each of these companies has been successful, and each has held a place of confidence in the industry over a long period of years.

The officers and directors of National Equipment Corporation include the following: Philip A. Koehring, president and treasurer; W. J. Koehring, vice president; W. H. Insley, vice president; Harold E. Smith, vice president; H. C. McCardell, vice president; W. J. Zimmers, secretary; and J. E. Uihlein, R. A. Uihlein, Willits Pollock, and J. W. Kieckhefer, directors.

The National Equipment Corporation was organized in 1927 by Philip A. Koehring and associates, to acquire the ownership of companies manufacturing construction machinery, and is continually expanding. The divisions of National Equipment are operated as independent units, with close cooperation in engineering matters, standardization of production methods, warehousing, service and other angles where savings can best be realized.

The addition of the Parsons and Insley companies to the group places Milwaukee in the position of being a center of the construction machinery industry. Koehring Company was organized in 1906 with an original investment of $15,000 by Wm. J. Koehring, Philip A. Koehring and Richard Kiel, who are still its principal officers. It manufactures a line of concrete mixers, paving machines, power shovels, cranes and draglines. Its growth during the last ten years has been rapid, sales having increased from $686,642 in 1917 to $5,542,998 in 1927, and are estimated at $6,000,000 for 1928. Philip A. Koehring, who is general manager of Koehring Company and president of National Equipment Corporation, has been twice president of the Milwaukee Association of Commerce and president of the National Association of Concrete Mixer Manufacturers.

The T. L. Smith Company is one of the largest manufacturers of concrete mixers in the world. The business was started by T. L. Smith in 1900, in which year he brought out his first tilting drum concrete mixer. Smith mixers have built such structures as the Muscle Shoals Dam, General Motors Building, etc. The business for some years has been under management of Harold E. Smith, who is a director and vice president of National Equipment Corporation.

The W. H. Insley Manufacturing Company has been developed by Mr. Insley from a steel fabricating and jobbing business, which is now one of the departments of the company's activities. The more profitable specialty of steel hoisting towers and chutes for concrete pouring has made the Company known throughout the country. Four years ago Mr. Insley introduced a one-half yard shovel and crane to his line, in which he has had sales of close to $1,000,000 during each of the last two years.

The Parsons Company was founded by George Parsons, an engineer and inventor, who also invented the Maytag Washing Machine at Newton, Iowa. Upon his retirement from the Company, his interest was purchased by H. C. McCardell, who has for some years been president and general manager, and owned a controlling interest in the Parsons Company common stock. The trench excavators which have been developed by the Parsons Company are largely used in the digding of trenches for oil pipe lines, underground telephone and telegraph cables, sewers, gas and water mains.

Erie City Presents Data on Boilers

The Erie City Boiler Works of Erie, Pennsylvania is distributing two illustrated 16 page catalogs which describe different types of boilers. Horizontal return tubular boilers are built for 100, 125 and 150 pounds working pressures and in sizes ranging from 25 to 250 horse power to the requirements of the Boiler Code of the American Society of Mechanical Engineers. The shell of the tubular boiler is made in two courses of one plate to the course and all longitudinal seams are of the butt joint type with inside and outside covering plates riveted to suit the pressure required. Tubes are placed in vertical rows and spaced to provide ample water circulation. Flat surfaces are braced with weldless steel stay rods from head to head. The boilers are fitted with manholes arranged in accordance with the best practice to permit of easy inspection and cleaning. The tubes and rivets are of mild steel and conform to standard specifications. The main braces are of steel pressed from the solid and the stay rods below the tubes are of staybolt steel of approved quality. The tubular boiler catalog contains some interesting data on smoke connections, setting full from stationary boilers with brackets and with hangers together with specifications for horizontal return tubular stationary boilers built with a factor of safety of fire.

The Erie City economic boiler is described as a self contained semi-portable, return tubular unit combining the advantage and economies of a well set and stationary boiler with the additional feature that it can be moved when occasion requires. It is the result of 40 years of successful experimenting and is said to be a rapid steamer, economical on fuel and requires little space. Only approved material is used in construction as the boilers are made of open hearth homogenous steel plate, rolled to full specified thickness on the edge. Tubes and rivets are of mild steel and conform to standard specifications and each boiler is inspected and tested by a responsible steam boiler inspection and insurance company, under a water pressure 50 per cent above the proposed working pressure.

Water Softener Data

"Crystalite" is the subject of the illustrated bulletin 183 issued by the International Filter Company, 333 W. 25th Place, Chicago. This 16 page technical booklet discusses: The chemistry of zeolite water softening, the early history and development of zeolites, crystalite the super rapid zeolite, the advantages of upflow softening illustrated with curves, the adaptability of crystalite to upflow softening, International crystalite water softener installations are shown, and important uses of crystalite softened water are listed.

A Large Hydraulic Dredge

The hydraulic dredge "Las Cruces" is now nearing completion at the works of her builders, the Ellicott Machine Corporation, Baltimore, Maryland.

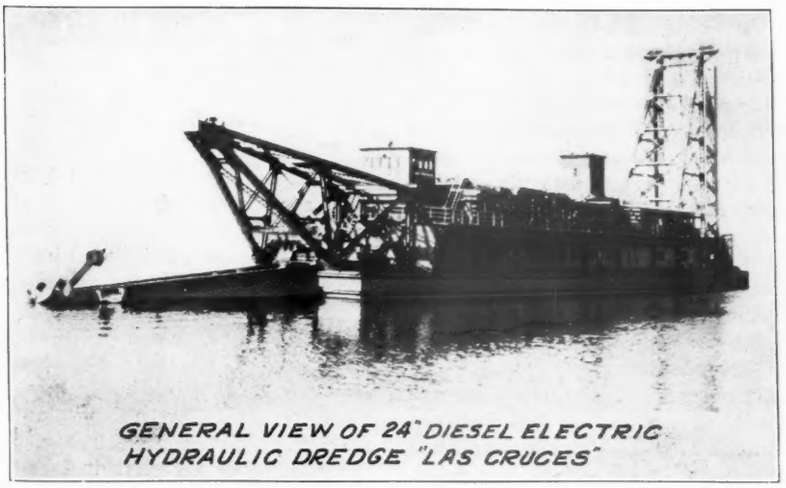
While the Panama Canal has owned and operated hydraulic dredges for many years, both in the original digging and in maintainence work, this machine is larger and far more powerful than any of the dredges previously used. In fact, it is probably the most powerful hydraulic dredge ever built.

Bids and plans were received from the largest dredge builders in the United States, and after they had been carefully examined, the Canal officials awarded the contract for this mammoth dredge to the Ellicott Machine Corporation, as its bid was considered lowest in price, meeting all the requirements of the Canal specifications to the best advantage.

Four Diesel engines directly connected to generators form the main power units, and all machinery is electric driven. The dredge is capable of pumping through a pipe line over two miles in length, and will have a capacity of 500 to 1,000 cubic yards per hour, depending on the material being dredged. The displacement in working order will probably be approximately 2500 tons. The hull, which has a length of 226 feet, width of 50 feet and depth of 14 feet, is built of steel, with numerous watertight bulkheads to insure safety of the dredge in case of collision. The scantlings of the hull are in excess of that required by the American Bureau of Shipping Rules. In addition to the watertight bulkheads, a water tight trough or flat has been built into the hull through which the discharge pipe runs. This makes the discharge pipe easily accessible and prevents leakage into the hull in case of breakage in the discharge pipe. The fuel and fresh water are carried in tanks on each side of the hull, and are sufficient for 30 days of operation.

The lower deck house is of steel, extending practically the full length of the dredge and 36 feet wide. Traveling cranes are provided over all of the machinery. Above the steel deck house are steel living quarters for 80 men. These quarters include separate state rooms for the officers, recreation rooms, mess rooms, a completely equipped galley and cold storage equipment.

The dredging pump is 24 inches in size and is located in the pump room in the forward end of the hull. The shaft from the pump passes through a watertight bulkhead to the main motor room. The main pump motor is of 2500 shaft horse power, double armature type. The control for this motor provides for a wide range of operating conditions.



GENERAL VIEW OF 24" DIESEL ELECTRIC HYDRAULIC DREDGE "LAS CRUCES"

The agitating ladder is capable of digging to a depth of 60 feet and to handle the hardest materials. It is 90 feet long and weighs approximately 400,000 pounds. The motor for the agitating machinery is mounted directly on the ladder and is a 350 horsepower. The control equipment provides for cutter speeds from 12 to 20 r.p.m.

The hauling and hoisting machinery is divided into two parts. At the forward end of the dredge three drums are provided, one for lifting the ladder and two for swinging the dredge. The motor for the forward hauling machinery is 100 h.p. variable speed, controlled from the pilot house. At the after end of the dredge are two drum winches for raising the spuds, these being driven by 100 h.p. variable speed motor, also controlled from the pilot house.

The main engines are four in number, each of 911 h.p. Fulton-Diesels. These are 8 cylinder, 4 stroke cycle trunk piston air injection type. The normal operating speed is 204 r.p.m. Each engine is directly connected to one main and one auxiliary direct current Westinghouse generator. Two of these engines with their generators are located in the forward engine room, the other two being located in the after engine room.

The electrical equipment is Westinghouse manufacture and the wiring is of the highest grade for marine service. The main switchboard is located on the main deck between the two engine rooms and provides panels for each main generator, each auxiliary generator, main pump motor circuit, cutter motor circuit, hauling motor circuits and the smaller auxiliary motors. The auxiliary equipment is very complete, including emergency generator sets for use when the main engines are shut down, motor driven air compressor, circulating pumps, fire pump, service pumps, fresh water and sanitary pumps, bilge pumps, fuel oil pumps, a complete machine tool outfit and ice machine.

The dredge is being built complete with quarters at the works of the Ellicott Machine Corporation, Baltimore, Maryland, and will be delivered to Cristobal, Canal Zone, afloat, ready to go to work.

The government specifications for the dredge were issued under the direction of the former Governor General of the Canal, Colonel M. L. Walker, and under the immediate supervision of Colonel Harry Burgess, chief engineer of maintenance, and at present governor of the canal; Captain R. P. Schlabach, naval constructor, formerly superintendent of the mechanical division; and John G. Claybourn, superintendent of the dredging division.

The Washington office of the Panama Canal superintended the work of construction, under the direction of A. L. Flint, chief purchasing officer, A. E. Doying, chief inspecting engineer, and C. H. Johnson, of the Mechanical Division, and B. E. Swain, inspector of machinery installations.

A Cleaning Fluid

E. F. Houghton and Company of Philadelphia is distributing a 36 page illustrated booklet which describes the different mixtures of Haughto-Clean and their different fields of usefulness. Besides being used in all classes of industrial plants, it is highly recommended for cleaning trucks and power rooms. It is said to be free from volatile matter, raw alkalis and filler, and 100 per cent soluble.

UNIVERSITY OF MICHIGAN LIBRARIES

Ball Bearings in the Quarry

Precision in terms of the ten thousandth part of an inch is not ordinarily associated with pit and quarry operations. Yet the industry in recent years has found an ever increasing use for a mechanism whose tolerances are measured by this unit, namely the ball bearing. The ball bearing is a precision unit, not only in respect to the accuracy of its dimensions, but also, in all factors pertaining to high-standard engineering and manufacturing.

The history of the adoption and growth of the use of ball bearings coincides with the great strides made by industry in general of late years. In a very real sense they are mutually interdependent. Brought into existence to overcome the deficiencies of plain bearings, the ball bearing was found to open possibilities of heavier loads and faster and more accurate operations. As more elaborate machinery was developed, this in turn brought about greater development of mounting design.

The application of ball bearings has not been limited to any one industry or any one type of machine as is shown by a survey of quarry machinery. Belt conveyors, crushers, draglines, drills, hoists, locomotives, mine cars, pumps, screens, tractors, trolley wheels and trucks are a partial list of the apparatus so equipped. Within this list are found several widely different types of machines as well as practically every form of service that is required of bearings. Elimination of friction, support of heavy thrust, radial and combined loads, accurate location of bevel gears and high speed capacity are all part of the daily work of the ball bearing. Furthermore, these operations are carried out in the dust and moisture to which outdoor machinery is exposed.

The trade in general is familiar with the properties of ball bearings but one characteristic, the load capacity, is not, perhaps, fully appreciated. The contact between balls and races has been erroneously called a "point" to distinguish it from the so-called "line" contact of a roller bearing. While it is an important feature of ball bearing design that this contact is not a long line subjected to errors of grinding, it is equally important that it is a definite, measurable area, not a point. The specimens in figure 1 show the elliptical shape of these areas and the way they increase with the load. It is an important fact that the unit stress in a ball bearing does not increase in proportion as the load is increased. This is demonstrated here by the fact that while the total load increase is 500 per cent, the pressure per square inch shows an increase of only 107 per cent. This explains in large measure the great load capacity of the ball bearing.

Another factor not ordinarily appreciated is the strength of a steel ball. Crushed between two other balls in the "3-in-line" test, it exhibits a strength far above any loads which a single ball would carry in a completed bearing. Supported in the races which curve around it, this strength is many times greater. To illustrate this point two exhibits were prepared recently. In one a standard ball was forced into a block of tough steel and was found entirely uninjured when the block was cut open. For a second exhibit, standard balls were forced against a hardened steel block—SAE steel No. 3240, hardened and drawn to 430 Brinell—under a load of ninety tons. The blocks were indented nearly one third of the ball diameter and the balls were forced .010 inch out of round, but they showed no signs of cracking or failure and their finish was practically unimpaired.

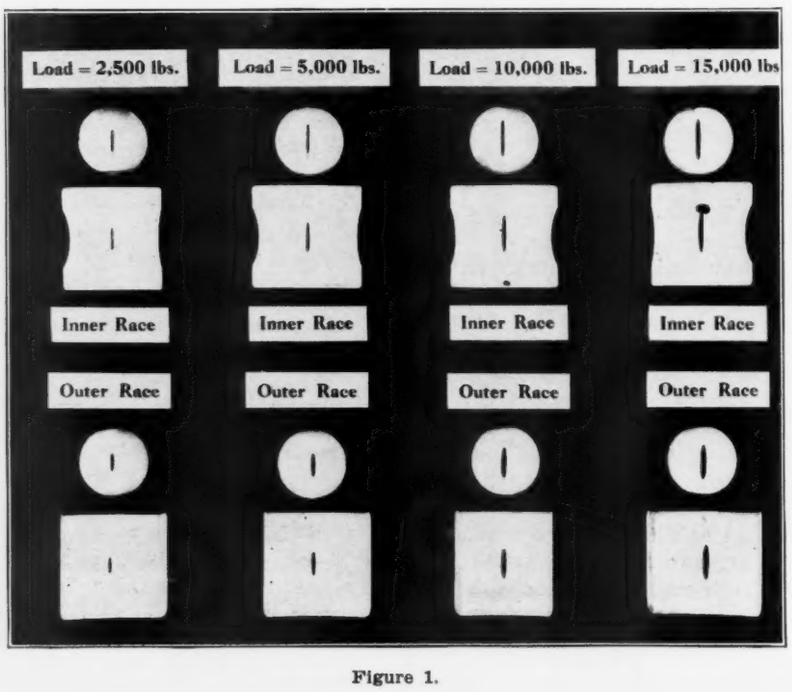


Figure 1.

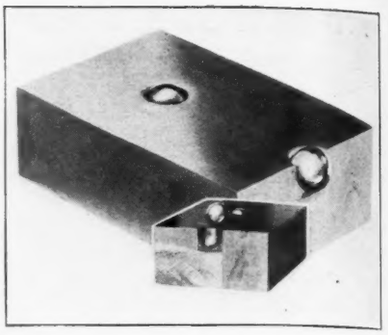


Figure 2.

It is the facility with which ball bearings lend themselves to protection from dirt and exposure by means of simple and inexpensive closures thus permitting the full utilization of their load capacity, low running friction, and other qualities that makes them invaluable to the quarry man. If they had no other superiority over plain bearings they would still find extensive demand. Add to this the ability to operate for months without attention to lubrication and they become invaluable. The anomaly of a precision unit supplying the solution to the problems of neglect and exposure naturally bring up questions as to the methods used and the type of problem which can be solved by these means. A study of actual installations will perhaps provide the best answer.

Belt conveyors provide a most direct and economical means of handling material, but like many large units, their success or failure depends upon details. The first cost of the belt alone, even in conveyors of moderate length, is a very considerable item. Whether it is worth the expense depends upon two things:

1st. The type of bearing used.

2nd. The design of each roll unit.

The use of ball bearings accomplishes two things: It reduces the operating friction and, in proportion, the power demand. It also brings about a marked reduction of the starting friction—a high quantity in the plain bearing—thus reducing the starting effort and much of the strain on the belt.

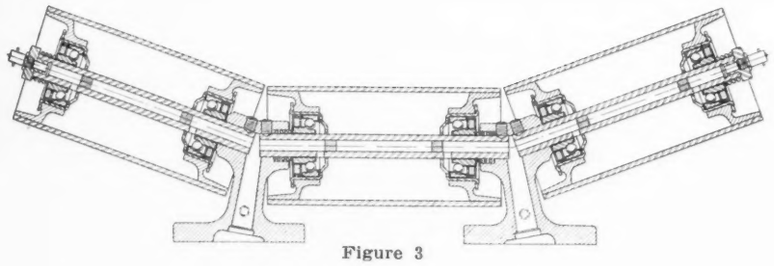


Figure 3

There are two principle roll designs, one for light conveyors using belts about twenty inches wide and the other for forty-eight and sixty inch units. The service requirements of the light conveyors are very simple, permitting a light inexpensive mounting. By fitting the bearings into pressed housings much of the machining ordinarily required is eliminated. The spring adjustment provides an excellent, trouble proof mounting. The bearings used are of the separable, angular contact type with a maximum complement of balls. This unit is capable of handling heavy loads with minimum friction under any conditions. Dirt and dampness are excluded; heat and cold do not affect the lubrication. The sticking of rolls which is so destructive to the belt is effectually eliminated.

The heavy duty unit requires a more elaborate bracket but there is little change in the bearing mounting except that a positive adjustment is required because of the heavier loads. Large units, which in some cases run to thousands of feet in length, are usually kept in continuous operation during the working period. Therefore, the bracket is arranged so that any one unit can be lowered, relieving it of load. The side rolls are removed by unbolting the outer bracket from its pedestal. To release the center roll the outer bolt at the base of the bracket shown, figure 4, is removed allowing it to pivot out of the way. In this way, any roll can be removed for inspection or servicing without interrupting operation.

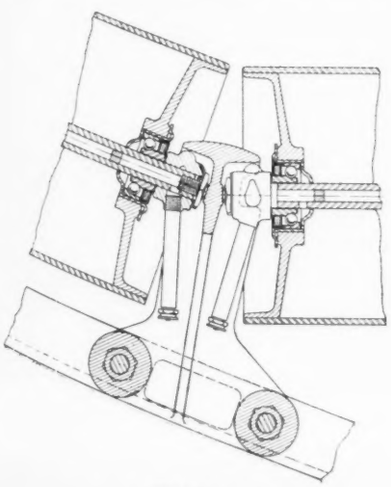


Figure 4.

A second type of application used extensively in the quarry and mine is the dump car and locomotive for hauling and dumping material. This type of installation is subjected to heavy loading and frequent shocks. The worm shaft of a locomotive which rotates at a fairly high speed should use one double row bearing to carry the thrust load from the gears. The worm wheel is supported by two double row bearings, a mounting which is used only under extreme loads. A double row bearing or two angular contact bearings mounted opposed must be used to support the thrust and radial loads from the wheel. In the quarry this mounting must be unusually heavy because the unevenness of the tracks causes heavy thrust in addition to the radial loads being carried.

In many locomotives, an ingenious clamping device does away with threads on the shaft. The adjusting nut is screwed on the spacer instead of the shaft. By turning it away from the bearing, the spacer is forced up tight, clamping the unit in place. A particularly valuable ball bearing application is to be found in electric motors. These are so generally used throughout industry that it is possible through numerous tests of hundreds of motors to prove the actual value of these installations.

Mounting designs in electric motors are based almost entirely on the use of two single row bearings with one locked to carry thrust, figure 6. The numerous variations of this arrangement are designed to meet different requirements of manufacture, assembly and service.

One concern which used 4639 motors with a total horsepower of 41,-355 computed conservatively that they could save over $16,000 per year in operating costs by the change to ball bearings. These figures were based on a test of 100 motors in its plant and several tests of other units containing from 75 to 200 motors. This saving was made up of the cost of rewinding burned out motors, the labor of oiling and inspection and the cost of replacing and installing failed bearings. It is interesting to note that 246 plain bearings gave out and only 15 ball bearings gave trouble.

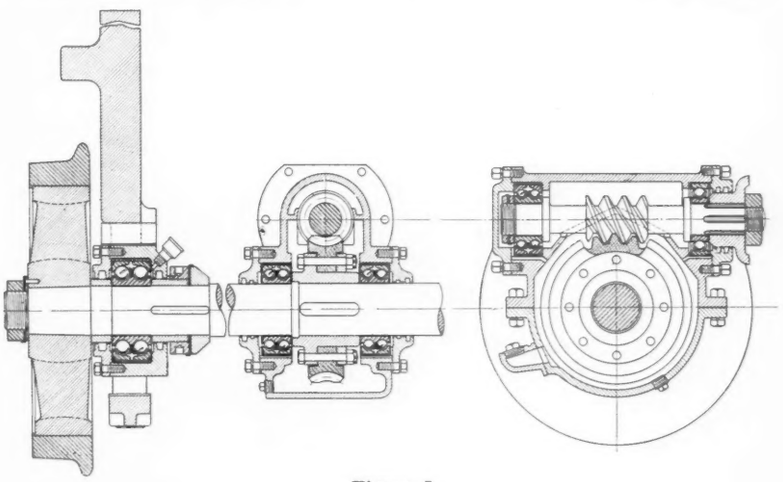


Figure 5.

Even though individual ball bearings cost more than the plain bearings, the total expense for replacement was less than one fifth of that of plain bearings.

In another installation of 2,531 motors, it was found that a dividend of 20.9 per cent was returned on the additional investment required to install ball bearings. In computing these figures, rather high depreciation was charged against the ball bearings. Actual results would easily surpass this figure. One further installation, of particular interest to the quarry man was recently reported from a cement mill. Here the abrasive dust caused so much wear in plain bearings that it was found necessary to rebuild the motors, installing ball bearings. None of these tests include saving due to lower friction loss. This item so far as the motor is concerned is usually found to result in faster and steadier work rather than a great reduction in power used.

UNIVERSITY OF MICHIGAN LIBRARIES

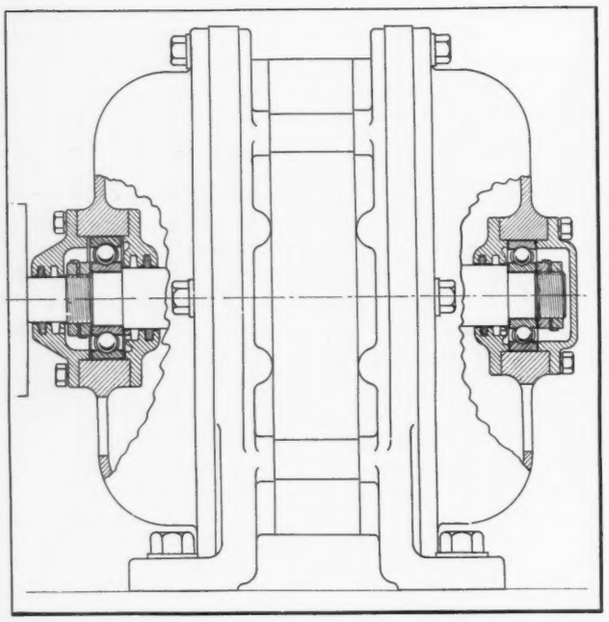


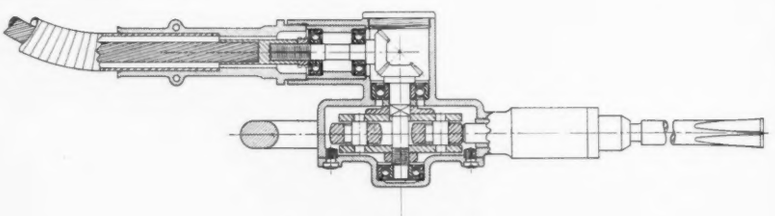
Figure 6.

Another class of mechanism in which ball bearings are very generally used is the portable tool. The principle characteristics required of such a device are lightness and freedom from lubrication troubles. Most of these tools, as hammers, drills and rock saws, are used under very dusty conditions. They are tilted in all directions and are laid down with no attention to dirt. It is absolutely necessary that the bearings be entirely enclosed and that the lubricant shall not leak out.

Light weight is promoted by ball bearings through the lightness of mounting requirements and in motorized units through the elimination of friction which permits a minimum motor size. The bearings are used to maintain accurate positioning of the gears and high speed shafts.

General machinery such as pumps, hoists and stationary engines, find considerable use for ball bearings in a variety of ways. The pump illustrated, for instance, uses a double row bearing to carry thrusts and accurately position the impellor. By using a bearing which does not wear and require adjustment, the clearances can be set properly with the assurance that the unit will maintain its highest efficiency at all times. The installation shown illustrates the use ofoutboard mountings in pumps and turbines to isolate the bearings from the water in the unit.

Throughout all installations in the quarry and elsewhere the outstanding feature of ball bearing performance is the low maintenance cost. The average bearing application requires lubrication but once a year. Their trouble free operation greatly re-



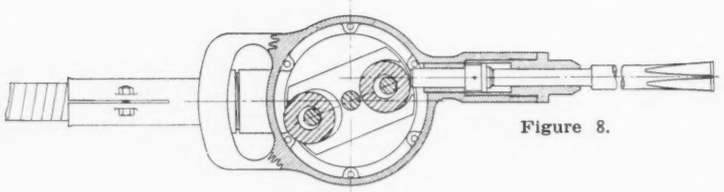


Figure 8.

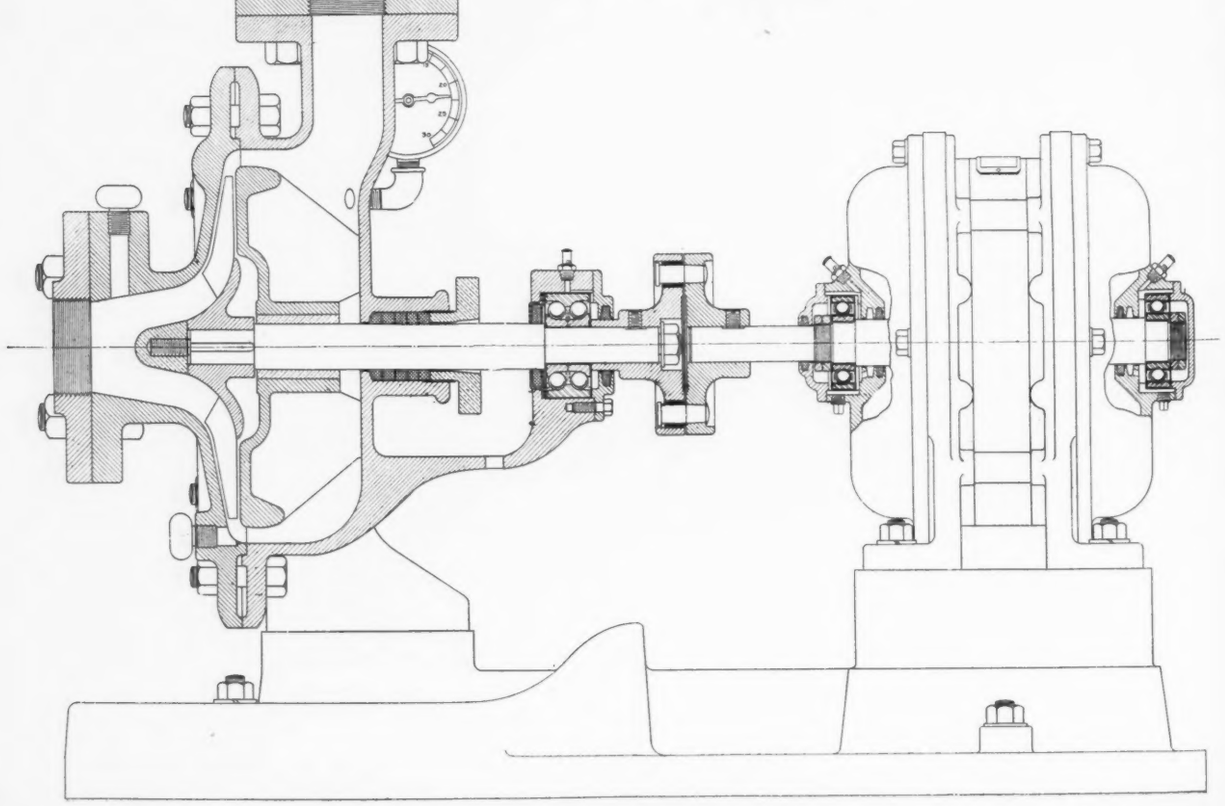


Figure 7.

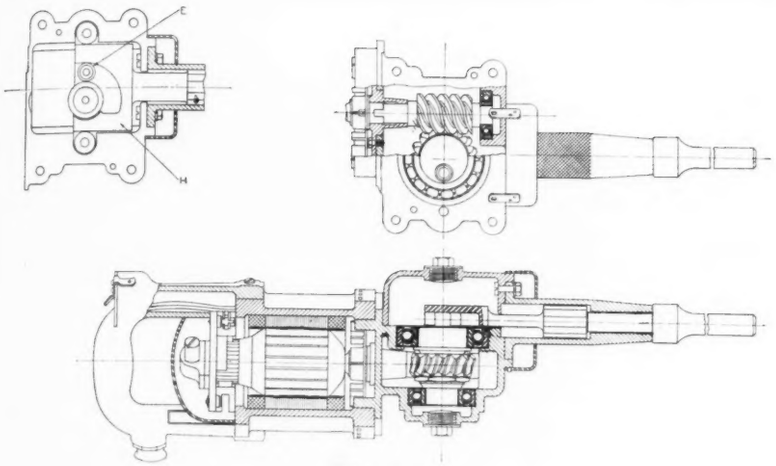


Figure 9.

duces the expense of idle machinery and men, disruption of schedules and numerous other evils resulting from breakdowns. These more than repay the manufacturer in actual dollars for the installation of ball bearings. Furthermore, should new ball bearings be required in case of accident or misuse they are easily obtained and quickly installed. The principal manufacturers make their bearings according to internationally standardized dimensions. Thus replacement means only the disassembly of the unit and the mounting of a new bearing in place. There is no fitting or scraping to be done and proper operation of the new bearing is assured.

These illustrations of the application of ball bearings are intended to convey some idea of the various types of work to which the bearings are adapted. There are numerous other applications in the quarry such as screens, crushers, and drag lines in which the principles of the bearing application are much the same as those shown. It is important to note that the full benefits of ball bearing applications are developed only by a careful consideration of the mounting design. For this reason, the principal ball bearing manufacturers maintain staffs of consulting engineers to assist bearing users in planning their machines. It is strongly recommended that all designs be submitted to these engineers for suggestions and approval.

Dust Collector Data

The Clark Dust Collecting Company of Chicago is distributing Bulletin No. 70. It consists of 4 illustrated pages and describes a system of dust collecting with a comparatively new skimmer device. The bulletin includes a number of letters from those who have had experience with this system.

Many Purpose Hoists

The Sterling Machinery Company of Kansas City, Missouri, is distributing its 48 page illustrated Bulletin A which is primarily devoted to descriptions of the different models of the type A hoists manufactured by the company. The hoists are made in many different sizes and each model has been designed to meet special conditions in industry. All of these hoists are equipped with Timken bearings, Johns-Manville asbestos frictions, gasoline motors are of the Continental red seal type and each bearing, including the bronze drum bushings are equipped with an Alemite Zerk fitting. An Alemite Zerk grease gun and a can of Alemite solidified oil are furnished with each hoist.

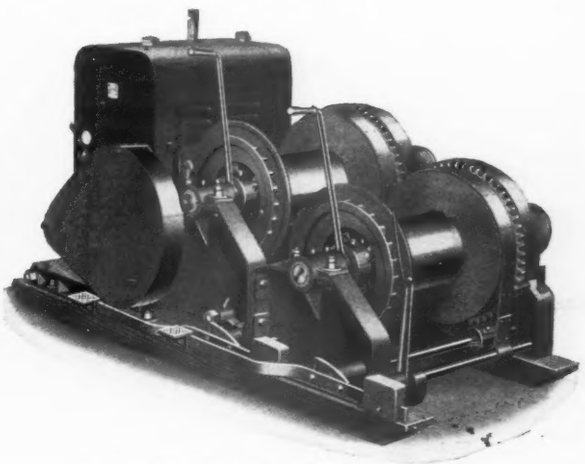
A.C. Data on Texrope Drives And Induction Motors

Allis Chalmers Manufacturing Company of Milwaukee, Wisconsin, is distributing two new illustrated bulletins to its clients. Bulletin 1118-E consists of 16 pages and illustrations with a description of its "Polyphase Induction motors," type AR and ARY with either sleeve or tapered roller bearings. The AR, squirrel cage, and ARY slip ring motors are a new development, and represent the result of experience and research conducted for a number of years. These motors range in output from ¾ to 200 h.p.

Bulletin 1228-H contains 16 pages devoted to illustrating and describing the "Texrope Drives." These are said to provide an efficient and dependable means for transmitting power to all classes of industrial equipment with a reduction in speed from 1:1 up to 7:1 ratio. This drive was primarily designed in response to a definite demand from the textile industries after a number of methods of power transmission had been found unsuccessful. The drive proper consists of a driving and a driven sheave, grooved for a multiplicity of texrope belts of trapezoidal cross section. The power is transmitted by the wedging contact between these belts and the V shaped grooves.

Caterpillar Traction Loses Southern Representative

Alfred Fletcher and his wife, en route to Buenos Aires, were lost in the Vestris disaster. Mr. Fletcher, who was a foreign trade expert, was to take charge of the South American sales force for the Caterpillar Traction Company.



A Double Friction Driven Gasoline Hoist.

A Jaw Crusher Bulletin

The New Holland Machine Company of New Holland, Pennsylvania, is distributing its latest Bulletin No. 100 containing illustrated descriptions of its type K jaw crushers. These crushers have been manufactured for more than 20 years and, with the exception of minor improvements, no change affecting their general design has been found necessary. Some of the features are that the main shaft is of the eccentric type; safety toggles are of the universal joint type, made with a slight curvature; swing arm is extra long and the shaft is securely keyed in the swing arm; and the bearings are thoroughly protected from dust and grit, and provided with felt oiling pads. All sizes may be furnished mounted on trucks and may be fitted with elevators.

UNIVERSITY OF MICHIGAN LIBRARIES

Rates for display advertisements in the Broadcast Section are given below. If you want to buy or sell used equipment, if you want a job or need a man, advertise your wants in Pit and Quarry. Advertisement copy for publication in the next issue should reach our office within one week after the date of this issue.

RATES PER INSERTION	1 Inch	2 Inches	3 Inches	4 Inches	5 Inches	6 Inches	8 Inches	9 Inches	10 Inches	12 Inches	15 Inches	20 Inches	30 Inches
1 Insertion	$ 3.75	$ 7.25	$10.75	$14.25	$17.75	$ 21.25	$28.25	$31.75	$35.25	$42.25	$56.25	$70.25	$105.00
2 Insertions	3.75	7.25	10.70	14.20	17.65	21.15	28.15	31.65	35.15	42.15	56.15	70.00	104.00
3 Insertions	3.75	7.20	10.65	14.15	17.55	21.05	28.05	31.55	35.10	42.05	56.05	69.75	103.00
4 Insertions	3.70	7.15	10.60	14.10	17.45	20.95	27.95	31.45	35.00	41.95	55.90	68.75	101.00
8 Insertions	3.65	7.05	10.50	14.00	17.25	20.75	27.75	31.25	34.80	41.75	55.70	67.50	98.00
13 Insertions	3.60	6.95	10.40	13.90	17.05	20.55	27.55	31.05	34.60	41.55	55.55	66.25	94.00
26 Insertions	3.50	6.75	10.20	13.70	16.65	20.05	27.05	30.65	34.20	41.05	55.05	64.00	88.00

INFORMATION—"Broadcast" space is sold by the advertising "inch." Each page contains 30 inches. The width of the page is divided into 3 columns, each 2¼ inches wide. Each column contains 10 inches measured the length of the column. Any space may be used measured by the *even* inch in height (not fractions), by 1, 2 or 3 columns in width. The size of a space is its height in inches multiplied by the number of columns in width. Example: a space 3 inches high by 2 columns wide is 6 inches. Copy changes made without additional charge.

It Pays to Advertise in PIT and QUARRY

"The response to our advertisement in Pit and Quarry was satisfactory."—The Twin Lakes Company, Kent, Ohio.

Complete Service Publishing Company

538 South Clark Street CHICAGO

Machinery for Sale

SPECIALS
1—4½'x16" Hardinge Steel Lined Mill
1—No. 6 Williams Universal Hammer Mill

CRUSHERS

Crushing Rolls

1—8"x5", 4—24"x12", 1—26"x15", 1—30"x10", 1—30"x16", 2—36"x16", 2—42"x16", 1—54"x24".

Gyratory

All sizes from No. 2 Reduction to No. 12K.

Jaw

1—6"x3", 2—8"x10", 1—6"x15", 2—9"x15", 1—11"x22", 2—12"x24", 1—18"x36", 1—42"x40".

Rotary

Two No. 0, two No. 1, one No. 1½, and one No. 2 Sturtevant Rotary Fine Crushers.

Ring Roll

One No. 1 and one No. 2 Duplex Sturtevant ring roll mills.

Ball and Tube Mills

3', 4', 4½', 5', 5½', 6', 8' Hardinge Mills and Tube Mills.

DRYERS

One 3'x30', Three 4'x30', One 4½'x30', One 5'x40', One 5½'x40', One 6'x60', One 7'x60' and One 8'x80' Direct Heat Rotary Dryers, One 5'x25', One 6'x30', Two 8'x80' Ruggles Coles type "A" and One 4'x20' Ruggles Coles type "B" Double Shell Rotary Dryers.

KILNS

4'x40', 5'x60', 6'x60', 6'x70', 6'x90', 6'x100', 6'x120', 7'x80', 8'x125'.

MILLS

Two 33" and two 42" Fuller Lehigh Mills.
1 No. 0000, 1 No. 00, 2 No. 1, 2—4 Roll, and 1—5 Roll Raymond.
Swing Hammer Mills, Griffin Mills, Attrition and Cage Mills.
Air separators, Screens, Elevators and Conveyors.

The Heineken Engineering Corp.
Industrial Engineers
117 Liberty St., New York City
Courtlandt 5130

SHOVELS

1—ERIE GAS & AIR; Shop No. 4100 series, New late 1927; 1-Yd. HIGH LIFT; Excellent condition.

1—31-B BUCYRUS; STEAM; Shop No. 4920 series, New 1927; 1½-yd. Dipper; Boom 23 ft.; Used 6 months. Like new.

CRANES

1—10-ton, cap. KOEHRING, Gasoline Crawler Crane, New 1926, 40 ft. Boom, Bucket Operating, First-class.

2—15-ton cap. NORTHWEST, Model No. 104, Gasoline Crawler Cranes and Draglines, New 1927, 50 ft. Booms, Extended Gantry, Bucket Operating, Like New.

1—20-B BUCYRUS, DIESEL Crawler Crane and Dragline, New 1926, 45 H. P. Diesel Engine, 42 ft. Boom, ¾-yd. Page Dragline Bucket, Excellent condition.

GREY STEEL PRODUCTS COMPANY
111 Broadway New York, N. Y.

CRUSHERS
Farrel 15-B-24 x 36 Jaw,—Manganese Fitted.
Kennedy No. 42 Gyratory Breaker.
Austin No. 10 Gyratory.
Gates 7½-K, Fine shape.
Kennedy Gearless No. 37 Reduction.
Gates Gyratory 12-K, 9-K, 7½-K 4N, 3 and 1
McCully Gyratory No. 8 5, 4 and .
Symons Disc, 48, 36, 24 and 18-in.
Allis Chalmers Blake Jaw Crusher 12x24 and 18x24.
Good Roads 10x20 portable and 10 x 20 on Skids.
Raymond Mill No. 1.
Stephens-Adamson all Steel Bucket, Elevator Style No. 22—60' Centers.
Stephens-Adamson Pan Conveyor.
Jaw Crushers 7x15, 9x18, 9x15 & 10x20.
Crushing Rolls various sizes.
Blake Type Jaw Crusher 18 x 24.
Sturtevant No. 1½ Rotary Fine Crusher.
OTHER CRUSHERS, SCREENS & CONVEYORS

CRANES & SHOVELS
Bucyrus Shovel 41 Cat. 1¼ yd.
Marion 270 Stripping Shovel.
Marion 31 Cat. 1¼ yd. low price.
Bucyrus Cl. 14 Cat. Dragline 80' boom, 2 yd.
Bucyrus Cl. 24 Dragline electric 100' Boom.
Northwest 104 & 105 Shovels.
P. & H. 206 Dragline, 38' Boom.
Speeder ½ yd. Gas. Cat. Shovel.
Byers Bearcat Crane 28' Boom, low price.
O. & S. Gas Cat. 40' Boom.
Byers Truck Crane 30' Boom, ¾ yd.
Bucyrus Shovel 80-B Cat. 2 yd.
Other makes and sizes on hand.
COMPRESSORS, CARS, LOCOMOTIVES, BOILERS AND POWER EQUIPMENT

F. MAYER
53 W. Jackson Blvd. Chicago, Ill.

WAREHOUSE SPECIALS
Immediate Shipment

2 Yd. and ¾ Yd. Hayward Extra Heavy 3-Leaf Orange Peel Buckets.
½ Yd. Mead-Morrison Class "W" Clam-Shell Bucket 8x36 and 10x16 Jaw Crushers, Cast steel Frames, Manganese Jaws.
18" Bucket Elevator, Chain type Centers up to 85 ft.
15 HP Clyde and 35 HP C. H. & E. Dbl. Drum Gasoline Hoists.
150 HP Fairbanks-Morse Diesel Engine with 2 Yd. Sauerman Slackline or Cableway Outfit. Steam Outfit same size.
200 HP Diesel Engine, 80, 100, 200 HP Steam Engines.
6", 8", 10", 12" and 20" Dredge Pumps.
All sizes Elect. Hoists. Air Compressors, Pumps, Boilers, Crushers, Screens, Loaders, Bins, etc.

LAKESIDE MACHINERY COMPANY
571 West Lake Street
Chicago, Ill.
Warehouses and Yards
4501 West Cortland St. 2335 West Austin Ave.

LOCOMOTIVES

American, 76 ton, 6 wheel saddle tank, new 1920.
Baldwin, 62 ton, 6 wheel saddle tank, new 1916
Porter, 16x24, 4 wheel saddle tank, 180 lbs.
Vulcan, 15x24, 4 wheel saddle tank, 180 lbs.
Porter, 15x24, 4 wheel saddle tank, 160 lbs.
Vulcan, 14x20, 4 wheel saddle tank, 175 lbs.
Vulcan, 12x18, 4 wheel saddle tank, 180 lbs.
Shay-Geared, 50 ton, new 1920, 200 lbs.
Standard gauge, gas. (7), 7 to 25 tons.
JAMES WOOD, 53 W. Jackson Blvd., CHICAGO

GASOLINE SHOVELS AND CRANES

1—1¼ Yd. Lorain 75 Cat. Shovel.
1—Link Belt Combination Cat. 1 Yd. Shovel and 50' crane boom.
1—Model 105 Northwest Combination ¾ yd. shovel and 40' crane boom.
1—Byers Bearcat Cat. with 30' crane boom.

GAS LOCOMOTIVES

1—12 ton Whitcomb standard gauge.
1— 7 ton Plymouth 36" gauge.

HOSTING ENGINES

1—60 HP National 3 drum 3 phase, 60 cycle 220 volts with swinger.
1—22 HP Lambert DD 3 phase, 60 cycle, 220 volts.
1—8¼x10 Stroudsburg Triple Drum Hoist with swinger. Boiler mounted.

DERRICKS

3—5 to 7 ton all-steel stiffleg derricks.
1—10 ton Wooden Stiffleg Derrick 80' boom.

BOILERS

1—100 HP Locomotive Type, ASME.
1—125 HP Locomotive Type, ASME.

DUMP CARS

6—4 yd. Western 36" gauge, steel beam and steel floors. Like new.

B. M. WEISS
1324 Widener Bldg. Philadelphia, Pa.